FISHERY DATA SERIES NO. 95

CREEL CENSUSES CONDUCTED IN INTERIOR ALASKA DURING 1988[1]

By

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ABSTRACT

During 1988, creel censuses were conducted on seven of the major fisheries within the Tanana River drainage. These fisheries included (1) Chatanika River whitefish (*Coregonus pidschian*, *Coregonus sardinella*, *Prosopium cylindraceum*) spear fishery, (2) upper Chena River Arctic grayling *Thymallus arcticus* fishery, (3) lower Chena River chinook salmon *Oncorhynchus tshawytscha* fishery, (4) Delta Clearwater River Arctic grayling fishery, (5) Piledriver Slough rainbow trout *Oncorhynchus mykiss* and Arctic grayling fishery, (6) Salcha River chinook and chum salmon *Oncorhynchus keta* fishery, and (7) Tangle Lakes and River system Arctic grayling fishery. In addition, one creel census was conducted at the West Dock causeway Dolly Varden *Salvelinus malma* fishery at Prudhoe Bay, and one creel census at the Seward Peninsula Arctic grayling fisheries. Angler effort, catch-per-unit-effort, harvest-per-unit-effort, catch, and harvest were estimated for six of these fisheries. Catch-per-unit-effort and harvest-per-unit-effort were estimated for two fisheries. Age composition, mean length-at-age, and Relative Stock Density were estimated for four fisheries. Angler demographics and angler opinions concerning the fisheries and their management were recorded for all fisheries.

KEY WORDS: creel census, catch, harvest, catch-per-unit-effort, harvest-per-unit-effort, angler effort, angler demographics, angler questionnaires, angler surveys, age composition, length-at-age, interior Alaska, Tanana River drainage, humpback whitefish, *Coregonus pidschian*, Least cisco, *Coregonus sardinella*, round whitefish, *Prosopium cylindraceum*, chinook salmon, *Oncorhynchus tshawytscha*, Arctic grayling, *Thymallus arcticus*, chum salmon, *Oncorhynchus keta*, rainbow trout, *Oncorhynchus mykiss*, Dolly Varden, *Salvelinus malma*.

INTRODUCTION

Background

The Arctic-Yukon-Kuskokwim (AYK) Region encompasses an area that covers almost two-thirds of the State of Alaska and includes all of Alaska north of Bristol Bay and the Alaska Range (Figure 1). Within this area, the state's largest river systems (Yukon, Kuskokwim, Colville, and Noatak) are found, along with thousands of lakes, and thousands of miles of streams. These waters support a large number of recreational fisheries for both freshwater and anadromous fish species that include Arctic cisco *Coregonus autumnalis*, Arctic char *Salvelinus alpinus*, Arctic grayling *Thymallus arcticus*, anadromous chinook salmon *Oncorhynchus tshawytscha*, anadromous and land-locked coho salmon *O. kisutch*, anadromous chum salmon *O. keta*, burbot *Lota lota*, Dolly Varden *Salvelinus malma*, humpback whitefish *Coregonus pidschian*, lake trout *Salvelinus namaycush*, least cisco *Coregonus sardinella*, northern pike *Esox lucius*, rainbow trout *O. mykiss*, round whitefish *Prosopium cylindraceum*, and sheefish *Stenodus leucichthys*.

For sport fishery management purposes, the AYK Region was divided into two areas, the Tanana River drainage (includes all waters within the Tanana River drainage), and the AYK area (includes all waters outside the Tanana River drainage) (Figure 1). Even though the AYK Region encompasses a very large area, the majority (approximately 75 percent) of the recreational angler-effort and harvest occurred near the major population centers (Fairbanks, Delta Junction, and Tok) within the Tanana River drainage (Figures 1 and 2). From 1977 to 1987, angler-effort in the AYK Region and Tanana River drainage increased at an annual rate of approximately 10% (Figure 2). Angler-effort is expected to increase as the major population centers grow.

From 1977 through 1982, harvest of all fish species increased about 19% annually to a peak of 179,115 in the Tanana River drainage and 274,541 in the AYK Region (Figure 2). Since 1983, harvest has decreased substantially in both the Tanana River drainage and AYK Region. The decrease in harvest that has occurred since 1983 was probably due to the overharvest of the major species in the Tanana River drainage and the subsequent decline of the major fish stocks. Because of this decline, restrictive management regulations were instituted for the major fisheries in the Tanana River drainage in 1987 and 1988.

With angler-effort expected to increase and with the newly imposed management regulations, the monitoring of the Tanana River drainage recreational fisheries becomes especially important. One of the most effective ways to monitor these fisheries is through the use of creel censuses.

A comprehensive analysis of the creel censuses that were conducted by the Alaska Department of Fish and Game (ADFG) in Region III (AYK Region) during 1988 is presented in this report. Many of the same sampling techniques and estimation procedures have been utilized for all the creel censuses. However, there were also many techniques and procedures that were specific to each creel census. For this reason, a general methods section is first presented that includes the general sampling techniques and estimation procedures

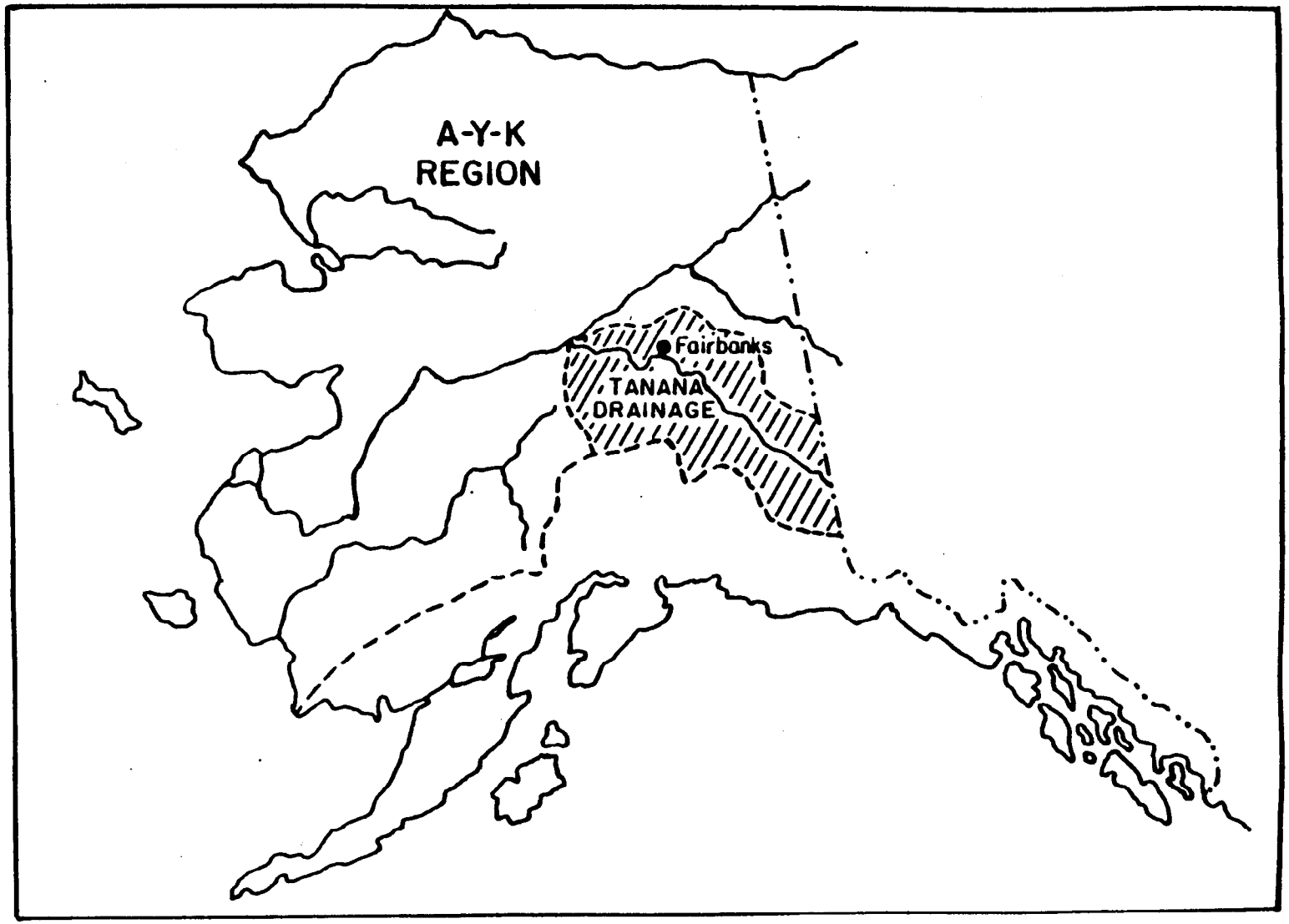

Figure 1. Map of Arctic-Yukon-Kuskokwim (AYK) Region and Tanana River drainage sport fish management areas, Alaska.

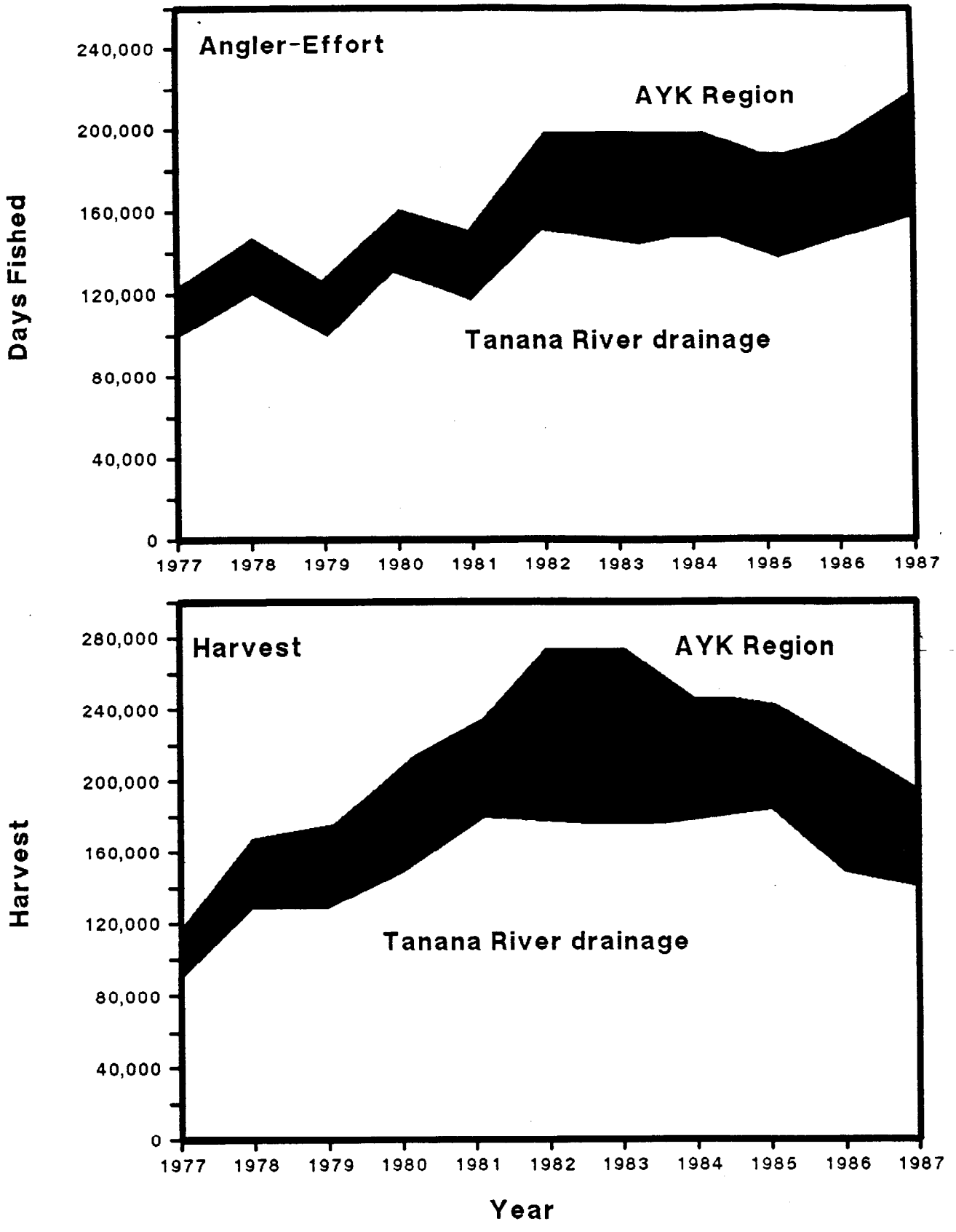

Figure 2. Effort and harvest by recreational anglers in the AYK Region (includes Tanana River drainage) and Tanana River drainage sport fish management areas, 1977-1987 (Mills 1979-1988).

utilized during the creel censuses. A separate chapter is then presented for each creel census. Each chapter contains an introduction, methods, results, and discussion section that are specific to each creel census.

Objectives of Creel Census Program

Creel censuses were conducted at seven of the major fisheries within the Tanana River drainage, one creel census at a fishery located at Prudhoe Bay, and one creel census at the major fisheries in Seward Peninsula[1]. The specific objectives of the creel censuses were to provide information concerning harvest, catch, angler-effort, catch-per-hour (CPUE), harvest-per-hour (HPUE), and biological data (i.e., mean length, and mean age of harvested fish). At most of these fisheries, some additional information was obtained that included: catch distribution among user groups, temporal and spatial use patterns, angler characteristics (i.e., sex and residency), angler opinions concerning management of a fishery, sport fishery impacts on idigenous stocks, stocked fish contribution to a fishery, and the effectiveness of in-season management decisions.

The long term goals of the creel census program are to: (1) develop historical data bases to allow monitoring of both the recreational fisheries and the exploited fish populations; (2) develop regulations that reflect the desires of the angling public while ensuring the sustained health of the resource; and (3) determine the effects of management regulations on the fisheries, fish populations, and recreational angling public.

METHODS

General Study Design

Two types of creel censuses were conducted in the AYK Region in 1988 (Table 1). The first type was harvest surveys in which angler effort, catch, harvest, CPUE, and HPUE were estimated. The second type of creel census was CPUE surveys, in which only CPUE and HPUE were estimated. Age and length data and angler information were collected during all creel censuses. Sampling procedures used in all harvest surveys were essentially the same and sampling procedures for all CPUE surveys were the same. A description of the general sampling procedures and data collection utilized during these studies are presented below.

General Sampling Procedures

All creel censuses were based on a stratified random sampling design. The strata in each fishery were defined to maximize the relative precision of the estimates of angler-effort (i.e. levels of angler-effort are expected to be similar within a stratum) and were based upon historical creel census data (when available). The number of angler counts and angler interviews collected in each fishery was determined by the amount of creel census technician time

[1] The Seward Peninsula creel census was summarized and reported on by Merritt (1989).

Table 1. Creel censuses conducted in the interior of Alaska during 1988.

Location	Species[1]	Type of Creel Census	Creel Census Information		
			A-L[2]	CPUE/ Ang. Inf.	Effort/ Harvest
Chatanika River	LC,HW,RW	Harvest	X	X	X
Upper Chena River	GR	Harvest	X	X	X
Lower Chena River	KS	Harvest	X	X	X
Delta Clearwater River	GR	Harvest	X	X	X
Piledriver Slough	RT,GR	CPUE	X	X	
Salcha River	KS,CS	Harvest	X	X	X
Tangles Lakes and River	GR,LT,BB	Harvest	X	X	X
West Dock (Prudhoe Bay)	DV	Harvest	X	X	X

[1] BB = Burbot, CS = Chum Salmon, DV = Dolly Varden, GR = Arctic Grayling, HW = Humpback Whitefish, KS = Chinook Salmon, LC = Least Cisco, LT = Lake Trout, RT = Rainbow Trout, RW = Round Whitefish, SS = Coho Salmon.

[2] A-L = Age and length data.

available each month and an estimate of the minimum number of samples needed to achieve the desired level of precision according to procedures described by Cochran (1977). For CPUE and harvest surveys, allocation of sampling effort was determined by proportional allocation based upon the amount of time in each stratum.

Angler-effort was only estimated for harvest surveys. Angler-effort was estimated from angler counts conducted at randomly selected time periods within a stratum. No angler count took more than one hour to complete. For this reason, angler counts were considered to be instantaneous estimates of the number of anglers present (Nuehold and Lu 1957). Both roving and/or stationary creel censuses were used depending upon the fishery. Roving creel censuses were used in fisheries with many access points and/or censuses that cover a large geographic area. Stationary creel censuses were used in fisheries with a small number of access points.

Angler interviews were conducted during both harvest and CPUE surveys. During harvest surveys, creel census technician time was split between counting anglers and interviewing anglers. However, only angler interviews were conducted during CPUE surveys. Angler interviews were used to collect the following information: CPUE, HPUE, angler characteristics, and biological data from harvested fish.

The sampling schedule for a creel census was developed by determining the number of sample periods in each stratum. Sample periods were defined as the time allocated to collect a sample. The sample periods were then numbered consecutively for an entire month. The periods to be sampled in each stratum were selected with the use of a random number table. Sample period numbers were drawn, without replacement, until the number of sample periods designated for that stratum had been selected. This procedure was completed independently for each stratum. The length of the sample period (hours needed to conduct angler count(s) and/or angler interview(s)) for each fishery was based on the type of count (roving or stationary) and the estimated time required to obtain a sufficient number of interviews (for stationary creel surveys) or to sufficiently cover the entire fishery area (roving creel surveys; Table 2). Multiple angler counts were conducted during some sampling periods. For multiple counts, a randomly selected time during each hour of the sample period was selected for an angler count.

General Data Collection

Only anglers actively fishing were counted during angler counts. For roving angler counts, the creel census technician counted anglers while traveling from one end of the fishery to the other (the direction of travel for the angler count was determined at random) at a constant rate of speed. Stationary angler counts were made from one to three vantage points, depending on the fishery, where the entire fishery could be seen.

Angler interviews were conducted for each individual angler contacted. The angler interviews were either complete- or incomplete-trip interviews. Complete-trip angler interviews were preferred. However, the majority of the angler interviews conducted during roving creel census occurred prior to the

Table 2. Summary of information collected during creel censuses conducted in the interior of Alaska during 1988.

Fishery	Time Period	Number of Strata	Hours in Sample Unit	Completed/ Incomplete	Roving/ Stationary	Angler Types
Chatanika River	9 Sep - 16 Oct	2	6	Both	Roving	Bt/Sh
Upper Chena River	14 May - 18 Sep	4	2 or 3	Both	Roving	Shore
Lower Chena River	2 Jul - 29 Jul	2	2	Both	Roving	Bt/Sh
Delta Clearwater River	4 Jun - 5 Sep	6	4	Both	Roving	Bt/Sh
Piledriver Slough	16 May - 9 Sep	3	2	Both	Roving	Shore
Salcha River	2 Jul - 24 Jul	2	3	Completed	Stationary	Bt/Sh
Tangle Lakes and River	4 Jun - 5 Sep	2	4	Completed	Stationary	Bt/Sh
West Dock (Prudhoe Bay)	11 Jul - 5 Aug	2	2	Both	Roving	Shore

completion of the fishing trip. Almost all the interviews obtained during stationary creel censuses were from anglers who had completed their fishing trip. All anglers present during a sample period were interviewed if possible. Anglers were randomly selected for interviews if all the anglers present could not be interviewed during the sample period.

During each interview, anglers were asked the following:

1) the length of time spent fishing;
2) the number of fish caught by species;
3) the number of fish caught and kept by species; and,
4) angler characteristics that include;
    a) male or female,
    b) youth or adult,
    c) resident or nonresident,
    d) local or nonlocal,
    e) tourist or military, and
    f) terminal fishing gear (spinner/bait/flies/jugs/trolling/spear).

In addition, anglers were asked several questions regarding management strategies and regulations. At all fisheries, the anglers were asked to rate the quality of fishing as either excellent, good, fair, or poor. In addition, specific questions about the fishery, and/or current or proposed management strategies and regulations were asked.

Biological data (i.e., fork length and age) were collected for all fish encountered during a creel census. It was necessary to sample all fish observed in the creel to achieve the specified level of relative precision. The mid-eye to fork of tail length was measured for all salmon species and fork length (tip of snout to fork of tail) was measured for all other species (Table 3). All length measurements were made to the nearest 1 millimeter. Scales were collected as aging structures from all recreational fish species encountered, except burbot and Dolly Varden char (Table 3). Otoliths, and vertebra were collected from burbot, Dolly Varden char, and lake trout (Table 3).

General Data Analysis

Estimation of angler effort, CPUE, HPUE, catch, and harvest was based on the expansion of sample period angler counts, catch, harvest, and angler-effort to the entire stratum. The following data analyses were used to estimate the primary parameters of the fishery: total angler-effort, CPUE, HPUE, catch and harvest.

Estimation of Angler-Effort:

The mean number of anglers per count in stratum i ($\bar{x}_i$) for each fishery was:

$$(1) \qquad \bar{x}_i = \frac{1}{n_i} \sum_{h=1}^{n_i} x_{hi} \ ,$$

Table 3. Summary of biological data collected from each fish species encountered during creel censuses conducted in the interior of Alaska during 1988.

Species	Type of length Measurement	Age Structure
Arctic Grayling	Fork length	Scales
Burbot	Fork length	Otoliths, Vertebrae
Chinook Salmon	Mid-eye to fork of tail	Scales
Chum Salmon	Mid-eye to fork of tail	Scales
Coho Salmon[1]	Mid-eye to fork of tail	Scales
Coho Salmon[2]	Fork length	Scales
Dolly Varden	Fork Length	Otoliths
Lake Trout	Fork length	Scales, Otoliths
Rainbow Trout	Fork length	Scales
Whitefish[3]	Fork length	Scales

[1] Anadromous coho salmon.
[2] Landlocked coho salmon.
[3] Includes least cisco, humpback whitefish, and round whitefish.

where:

x_{hi} = number of anglers counted during count h in stratum i, and

n_i = total number of counts in stratum i.

The estimate of sampling variance $\bar{x}_i$ ($V[\hat{\bar{x}}_i]$) was:

$$(2) \qquad V[\hat{\bar{x}}_i] = \frac{1}{n_i - 1} \sum_{h=1}^{n_i} (x_{hi} - \hat{\bar{x}}_i)^2 .$$

The mean number of anglers per hour ($\bar{X}$) was estimated by:

$$(3) \qquad \bar{X} = \frac{1}{N} \sum_{i=1}^{L} N_i \bar{x}_i ,$$

where:

N_i = number of hours in stratum i,

N = total number of hours in the fishery, and

L = total number of strata in the fishery.

The sampling variance of the mean number of anglers per hour ($V[\hat{\bar{X}}]$) was estimated by:

$$(4) \qquad V[\hat{\bar{X}}] = \frac{1}{N^2} \sum_{i=1}^{L} N_i^2 \frac{(N_i - n_i)}{N_i} V[\hat{\bar{x}}_i].$$

The total number of angler hours (E_i) in stratum i for each fishery was estimated by (Lambou 1961):

$$(5) \qquad \hat{E}_i = N_i \bar{x}_i ,$$

and, the estimate of the total number of angler hours ($\hat{E}_T$) in each fishery was:

$$(6) \qquad \hat{E}_T = N\bar{X} = \sum_{i=1}^{L} E_i .$$

The estimate of the variance for total angler hours ($V[\hat{E}_T]$) was:

(7) $$\hat{V[E_T]} = N^2 V[\bar{X}].$$

Estimation of CPUE and HPUE:

The method for estimating CPUE and HPUE for a species was determined by first testing the hypothesis that CPUE and HPUE from incomplete trip angler interviews were not significantly different than estimates of CPUE and HPUE from complete trip angler interviews. This hypothesis was tested by comparing the CPUE and HPUE from incomplete and complete trips from the same fishery and stratum. For a specific fishery, species, and stratum, CPUE and HPUE were estimated for complete and incomplete trips by the jackknife procedure (Efron 1982):

(8) $$\overline{\overline{CPUE}}_{ik} = \frac{1}{a_i - 1} \left[\frac{\sum_{j \neq k} c_{ij}}{\sum_{j \neq k} e_{ij}} \right] \Bigg|_{k=1}^{a_i},$$

where:

$\overline{\overline{CPUE}}_{ik}$ = mean CPUE of all anglers interviewed during stratum i, excluding the kth angler,

a_i = number of anglers interviewed during stratum i,

c_{ij} = catch of angler j interviewed during stratum i,

e_{ij} = effort (hours fished) of angler j interviewed during stratum i, and

$k = 1, 2, 3, \ldots, a_i$;

and,

(9) $$CPUE_i = \frac{1}{a_i} \sum_{k=1}^{a_i} \overline{\overline{CPUE}}_{ik},$$

where:

$CPUE_i$ = jackknife CPUE of anglers interviewed during stratum i.

$\overline{\overline{HPUE}}_{ik}$ was estimated by substituting h_{ij} for c_{ij} in equation (8),

where:

$\overline{\overline{HPUE}}_{ik}$ = mean HPUE of all anglers interviewed during stratum i,excluding the kth angler, and

h_{ij} = harvest of angler j during stratum i.

The jackknife HPUE of anglers interviewed during stratum i ($HPUE_i$) was estimated by substituting $HPUE_{ik}$ for $CPUE_{ik}$ in equation (9).

Omitting the finite population correction factor, the variance of $CPUE_i$ was estimated by the jackknife procedure:

$$(10) \qquad \hat{V}[CPUE_i] = \frac{a_i - 1}{a_i} \sum_{k=1}^{n} \overline{(CPUE_{ik} - CPUE_i)}^2 ,$$

where:

$\hat{V}[CPUE_i]$ = jackknife variance of $CPUE_i$ of anglers interviewed during stratum i.

The variance of $HPUE_i$ was estimated by substituting $HPUE_i$ and $\overline{HPUE_{ik}}$ for $CPUE_i$ and $CPUE_{ik}$ in equation (10),

where:

$V[HPUE_i]$ = jackknife variance of $HPUE_i$ of anglers interviewed during stratum i.

An independent t-test used, when needed, to test the hypothesis that incomplete trip angler interviews provided unbiased estimates of complete trip angler interviews. If the hypothesis was not rejected, $CPUE_i$ and $HPUE_i$ and their variances were estimated using equations 8, 9, and 10 with complete and incomplete trip angler interviews pooled. If the hypothesis was rejected, $CPUE_i$, $HPUE_i$, and their variances were estimated with complete trip angler interviews only (as above with equations 8, 9, and 10).

Finite population correction factors were applied to V(CPUEi) and $V(HPUE_i)$ when the total number of anglers in stratum i of a fishery could be estimated (harvest surveys only). The finite population correction factor for $V[CPUE_i]$ and $V[HPUE_i]$ were estimated by:

$$(11) \qquad \hat{A}_i = \frac{N_i \bar{x}_i}{\frac{1}{a_i} \sum_{j=1}^{a_i} e_{ij}},$$

and,

$$(12) \qquad \hat{f}_i = 1 - \frac{a_i}{\hat{A}_i} ,$$

where:

$\hat{A}_i$ = estimate of the total number of anglers fishing during stratum i, and

$\hat{f}_i$ = finite population correction factor for $V(CPUE_i)$ and $V(HPUE_i)$.

Therefore, the estimate of $V[CPUE_i]$ became:

$$(13) \qquad \hat{V}[\overline{CPUE}_i] = \hat{f}_i \hat{V}[\overline{CPUE}_i],$$

and the estimate of $V[HPUE_i]$ became:

$$(14) \qquad \hat{V}[\hat{HPUE}_i] = \hat{f}_i \hat{V}[\hat{HPUE}_i].$$

Estimation of Harvest:

The total catch for a species (C_T) and total harvest for a species (H_T) were estimated by:

$$(15) \qquad C_T = \sum_{i=1}^{L} \hat{E}_i CPUE_i,$$

and,

$$(16) \qquad H_T = \sum_{i=1}^{L} \hat{E}_i HPUE_i.$$

The variance of C_T and H_T (assuming strata estimates are independent) were estimated from the formula for the product of two random variables (Goodman 1960):

$$(17) \qquad \hat{V}[\hat{C}_T] = \sum_{i=1}^{L} \hat{V}[E_i \hat{CPUE}_i],$$

$$= \sum_{i=1}^{L} \left[\hat{E}_i^2 \hat{V}[\hat{CPUE}_i] + CPUE_i^2 \hat{V}[\hat{E}_i] - \hat{V}[\hat{E}_i] \hat{V}[\hat{CPUE}_i] \right],$$

and,

$$(18) \qquad \hat{V}[\hat{H}_T] = \sum_{i=1}^{L} V[E_i \hat{HPUE}_i],$$

$$= \sum_{i=1}^{L} \left[\hat{E}_i^2 V[\hat{HPUE}_i] + \hat{HPUE}_i^2 V[\hat{E}_i] - V[\hat{E}_i]V[\hat{HPUE}_i]\right],$$

The assumptions necessary for these analyses were:

(1) incomplete trip angler interviews provided an unbiased estimate of completed trip angler interviews in roving creel surveys;

(2) interviewed anglers were representative of the total angler population;

(3) no significant fishing effort occurred outside the defined fishing day; and,

(4) anglers were interviewed in approximate proportion to their abundance in any given sample unit.

Analysis of Biological Data:

For each species encountered during a creel survey, percent age composition and mean fork length (mm) at age of fish harvested were estimated. The normal theory approximation of the binomial distribution was used to estimate standard error for the percentages by age group.

Relative Stock Density (RSD) was estimated for the harvest of each species in a fishery (Gabelhouse 1984). The minimum length of each RSD category was a percentage of the recorded world record length for a species (listed by the International Game Fish Association). The five length categories were "stock" (20-26% of world record length), "quality" (36-41% of world record length), "preferred" (45-55% of world record length), "memorable" (59-64% of world record length), and "trophy" (74-80% of world record length) length classes. Each RSD category was a percentage of harvested fish that were over the minimum stock length and fall within each RSD category. The normal theory approximation of the binomial distribution was used to establish standard error for the percentage of each RSD category.

Analysis of Angler Characteristics and Angler Questionnaires:

For each fishery, angler demographics were calculated from angler interviews as a percentage of the following: male/female, adult/youth, resident/non-resident, local/non-local, tourist/military/neither, and terminal gear types used. At all fisheries, anglers interviewed were asked to rate the quality of fishing at a particular fishery. A mean rating was then calculated for each fishery from the following scale: Excellent = 1, Good = 2, Fair = 3, and Poor = 4. In addition, questions specific to each fishery were asked of anglers interviewed. Number and percent opinions to all these questions were

calculated. The normal approximation of the binomial distribution was used to calculate the standard error for the calculated percentages.

CHAPTER 1 - CHATANIKA RIVER WHITEFISH SPEAR FISHERY

Introduction

The Chatanika River supports a large fall spawning run of least cisco, humpback whitefish, and round whitefish. Because of its proximity to Fairbanks (Figure 3) and the large size of this spawning run, a fall whitefish spear fishery has developed at the Chatanika River. In 1987, this fishery accounted for over 90% of the whitefish harvest in the Tanana River drainage and over 75% of the Statewide whitefish harvest (Table 4; Mills 1988). Most of the whitefish harvested during the Chatanika River spear fishery are least cisco and humpback whitefish. A few round whitefish are harvested along with incidental spearing of sheefish, Arctic grayling, burbot, and longnose suckers *Catastomus catastomus*.

The whitefish spear fishery in the Tanana River drainage began in 1969. Historically, whitefish were pursued by recreational anglers with conventional rod and reel. However, because of the difficulty of catching whitefish on rod and reel, these users began to seek other means of harvesting whitefish. The result was the establishment of a spear fishing season for whitefish within the Tanana River drainage. The spear fishery on the Chatanika River developed rather slowly. A creel census in 1970 estimated a harvest of 400 whitefish (Table 4; Hallberg 1985). Estimates of harvest from 1972-1977 averaged around 2,000 whitefish. However, since 1977 harvest of whitefish has increased at an average annual rate of 34%, making it the fastest growing recreational fishery in the Tanana River drainage (Table 4).

Harvest has averaged about two to three whitefish per hour since 1972 (Hallberg 1985). HPUE was five least cisco and 0.76 humpback whitefish per hour in 1986 (Clark and Ridder 1987). In 1986, the estimated harvest of whitefish was 19,686 fish, with estimated exploitation rates of 23% and 17% for least cisco and humpback whitefish, respectively (Clark and Ridder 1987; Hallberg and Holmes 1987). In 1987, an on-site creel census estimated harvest at 28,591 whitefish, with exploitation rates estimated to be 43% for least cisco and 17% for humpback whitefish (Hallberg 1988, Baker 1988). Because of the high exploitation rates in 1986 and 1987, a fifteen whitefish daily bag and possession limit was instituted in 1988. Prior to 1988, there was no bag and possession limit for whitefish in the Tanana River drainage.

During the middle of the creel census conducted in 1987, it was found that spear fishing was occurring in areas outside the censused area. Prior to 1987, it was believed that the majority of the spear fishing occurred inside the censused area. Because of this, the harvest estimates for whitefish were expanded to include the new spearing area, called the ditch area (Baker 1988; Figure 3).

Concern over this rapidly expanding fishery and potential effects on the stock status of whitefish prompted the Division of Sport Fish, Alaska Department of Fish and Game to initiate an in-depth research project in 1986 that has continued through 1988. The goal of this research was to estimate population abundance, harvest levels, species composition of the runs, and exploitation rates of whitefish in the spear fishery. Part of this research was a creel

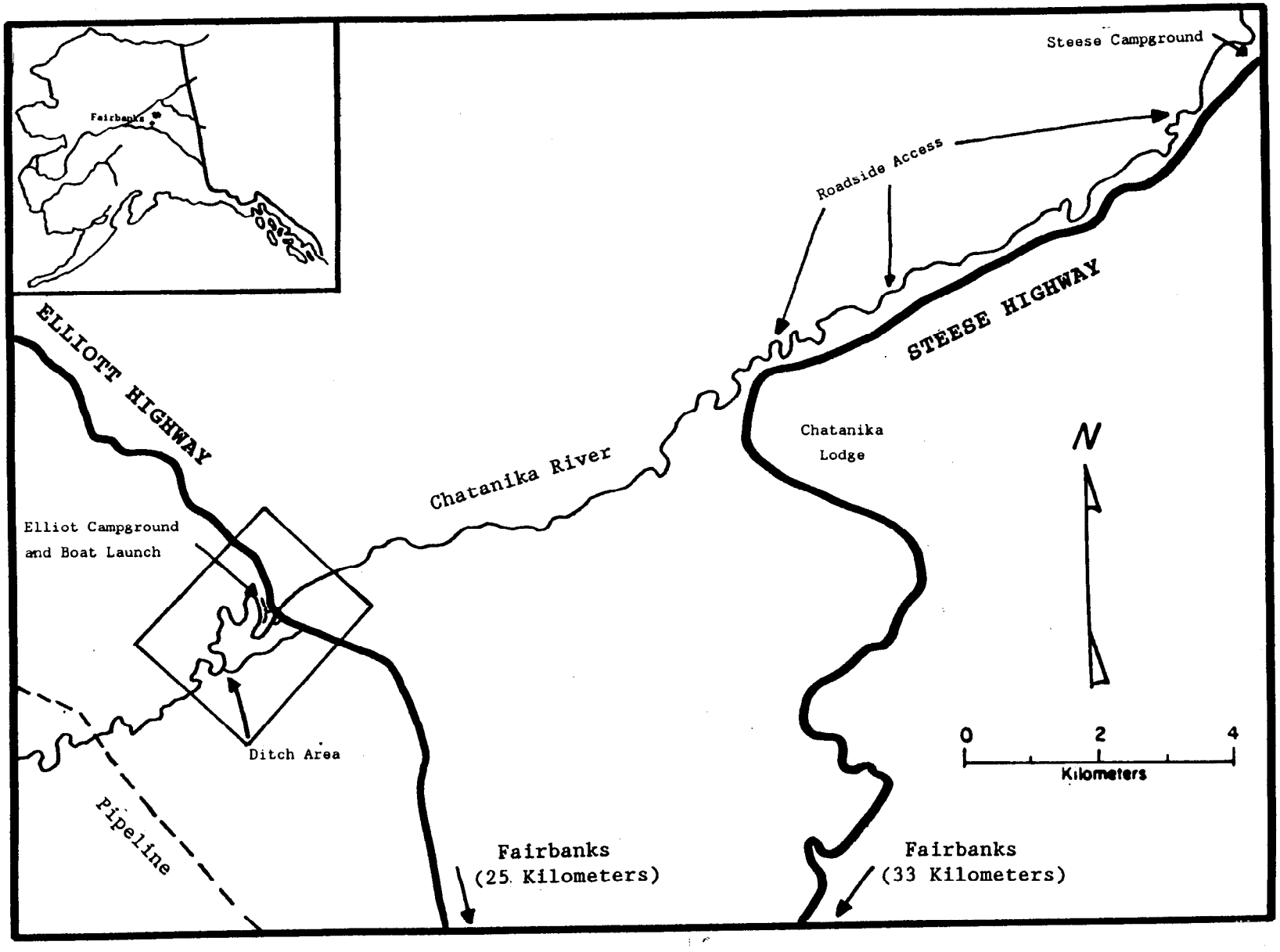

Figure 3. Map of the Chatanika River, Tanana River drainage, Alaska.

Table 4. Estimated annual harvest of whitefish obtained from the Statewide harvest survey and on-site creel census of the fall Chatanika River whitefish spear fishery, 1977-1988.

Year	Chatanika River		Tanana River Drainage[1]	Statewide[1]
	Postal Survey[1]	On-Site Creel Census		
1977	1,635	986	3,378	6,748
1978	6,013	5,517	6,573	11,731
1979	3,021	2,183	5,159	9,666
1980	3,340	1,587	5,958	11,464
1981	3,185	---	4,873	9,251
1982	6,640	---	8,643	15,433
1983	5,895	---	8,311	16,872
1984	9,268	5,758	11,658	16,719
1985	14,350	4,561	20,230	30,337
1986	22,038	19,105	26,810	39,718
1987	25,074	28,591	26,435	32,602
1988	---	8,326[2]	---	---

[1] Taken from Mills (1978-1988).
[2] Fifteen whitefish daily bag and possession limit was instituted in 1988.

census that not only provided information on angler-effort, harvest, and HPUE; but also provided biological data on mean fork length-at-age, sex ratios, and age composition of the harvest. The creel census portion of this project is presented below.

The specific objectives of the 1988 creel census at the Chatanika River spear fishery were to:

1) estimate angler-effort at the campground, ditch, and Steese Highway areas;

2) estimate HPUE (harvest-per-hour) and harvest of least cisco, humpback whitefish, and round whitefish at the campground, ditch, and Steese Highway areas;

3) estimate percent age composition, Relative Stock Density (RSD), and mean fork length-at-age (mm) for each age class of least cisco and humpback whitefish;

4) estimate the percent composition of angler demographics that include: a) male/female, b) adult/youth, c) resident/non-resident/military, d) local/non-local, e) tourist/other, and f) terminal fishing gear (spinner/bait/flies/jigs/trolling/spear/bow and arrow) for the Chatanika River; and,

5) estimate the percent response (opinions) to questions asked anglers at the campground, ditch, and Steese Highway areas.

In addition, least cisco and humpback whitefish in the harvest were examined for tags, in conjunction with the Whitefish Population Abundance project.

Methods

The majority of the spear fishing occurred in three areas (campground, ditch, and Steese Highway areas) along the Chatanika River (Figure 3). The campground and ditch areas are located where the Elliott Highway crosses the Chatanika River. In the campground area, spear fishing was limited to a 2 km section of river just downstream of the Elliott Highway Bridge. Spear fishing in the ditch area was limited to a 3 km section of river that is located downstream of the campground area. The third spear fishing area is located approximately 30 km above the Elliott Highway Bridge, where the Chatanika River is accessible from the Steese Highway (Figure 3). At all the areas, the majority of the spear fishing was from shore, although there was a small amount of spearing from boats.

The Chatanika River whitefish creel census was a harvest survey. The harvest survey started 9 September and was conducted through 16 October. The creel census was conducted in the evenings from 2000 to 0200 hours when the majority of the spear fishing occurred. The sample period for the fishery was 6 hours in duration. The fishery was split into weekday (Monday through Thursday) and weekend (Friday through Sunday) strata. Sampling effort was allocated proportionally to each stratum based upon the amount of time in each stratum.

Forty-three percent of sampling effort was allocated to weekend strata and 57% to weekday strata.

The creel census was split into three sampling areas: campground, ditch, and Steese Highway areas. Three creel clerks conducted the sampling with one creel clerk assigned to each of the areas. The three areas had more than one access point, therefore a roving harvest survey was utilized in the three areas.

Within the campground and ditch areas, four samples were collected each week in each area over the entire duration of the fishery. One angler count was conducted at a randomly selected time each hour of a six hour sample period. The remainder of each hour was spent interviewing anglers as they leave the fishery. Angler counts at the campground area were conducted by visiting three viewing locations where all anglers could be seen. The entire count took approximately 15 minutes to complete. Angler counts were conducted in the ditch area by walking the entire 3 km stretch of river and counting anglers as they were encountered.

At the Steese Highway area, two samples were conducted each week for the duration of the fishery. Four angler counts were conducted during each six hour sample period. Angler counts were conducted by driving the length of Steese Highway adjacent to the Chatanika River and counting anglers at the four access points along the highway (Figure 3). Angler counts took approximately 20 minutes to complete. The rest of each hour was spent interviewing anglers at the different access points. Whenever possible, anglers were interviewed after they had finished spear fishing.

Harvest sampling was conducted while interviewing anglers. All least cisco and humpback whitefish encountered during the creel census were checked for fin clips and floy tags. A subsample of 50 least cisco and humpback whitefish each were measured for fork length to the nearest 1 mm. Scales were not collected from whitefish this year during the creel census because they were collected during the population sampling portion of program conducted before the creel census (Hallberg in prep.).

Results and Discussion

Angler-Effort, HPUE, and Harvest Estimates:

A total of 254 angler counts were conducted and 692 anglers interviewed in the three areas combined. Six-hundred-twenty-nine of the anglers had completed spear fishing, while 63 anglers were still fishing when interviewed (Table 5). Of the anglers interviewed, 371 were interviewed at the campground area (Table 6), 279 were interviewed at the ditch area (Table 7), and 42 were interviewed at the Steese Highway area (Table 8). Estimated angler-effort for the three areas was 3,974 hours; of which 56% (2,237 hours) was expended in the campground area, 36% (1,440 hours) in the ditch area, and 8% (297 hours) in the Steese Highway area.

The estimated HPUE of least cisco in the campground area was 0.633 fish-per-hour and 2.112 fish-per-hour in the ditch area (Table 9). Total estimated

Table 5. Number of angler interviews, angler counts, and estimates of angler-effort (hours) at the Chatanika River (combined areas), Tanana River drainage, Alaska, 1988.

Stratum	Angler Interviews			Angler-Effort			
	Complete	Incomplete	Total	Counts	Hours	SE	CV(%)
Combined Areas							
9 Sep - 11 Sep	3	5	8	14	31	13	42
12 Sep - 15 Sep	5	1	6	18	54	16	30
16 Sep - 18 Sep	37	11	48	22	175	71	41
19 Sep - 22 Sep	27	3	30	28	312	61	20
23 Sep - 25 Sep	168	17	185	33	711	59	8
26 Sep - 29 Sep	91	5	96	28	692	85	12
30 Sep - 2 Oct	100	3	103	22	777	100	13
3 Oct - 6 Oct	44	2	46	31	356	63	18
7 Oct - 9 Oct	104	13	117	24	628	55	9
10 Oct - 13 Oct	35	3	38	24	157	31	20
14 Oct - 16 Oct	15	0	15	10	81	27	33
9 Sep - 16 Oct	629	63	692	254	3,974	196	5

Table 6. Number of angler interviews, angler counts, and estimates of angler-effort (hours) at the campground area (Elliott Highway) of the Chatanika River, Tanana River drainage, Alaska, 1988.

Stratum	Angler Interviews			Angler-Effort			
	Complete	Incomplete	Total	Counts	Hours	SE	CV(%)
Campground Area							
9 Sep - 11 Sep	3	5	8	7	31	13	42
12 Sep - 15 Sep	2	1	3	11	33	12	36
16 Sep - 18 Sep	24	4	28	10	54	13	24
19 Sep - 22 Sep	9	0	9	12	188	47	25
23 Sep - 25 Sep	94	15	109	14	384	48	13
26 Sep - 29 Sep	56	5	61	12	468	75	16
30 Sep - 2 Oct	41	0	41	7	350	86	25
3 Oct - 6 Oct	30	1	31	12	268	59	22
7 Oct - 9 Oct	43	11	54	11	314	35	11
10 Oct - 13 Oct	12	3	15	8	75	27	36
14 Oct - 16 Oct	12	0	12	4	72	26	36
9 Sep - 16 Oct	326	45	371	108	2,237	155	7

Table 7. Number of angler interviews, angler counts, and estimates of angler-effort (hours) at the ditch area (Elliott Highway) of the Chatanika River, Tanana River drainage, Alaska, 1988.

Stratum	Angler Interviews			Angler-Effort			
	Complete	Incomplete	Total	Counts	Hours	SE	CV(%)
Ditch Area							
9 Sep - 11 Sep	0	0	0	7	0	0	0
12 Sep - 15 Sep	3	0	3	7	21	11	52
16 Sep - 18 Sep	8	4	12	10	49	16	33
19 Sep - 22 Sep	15	2	17	12	100	33	33
23 Sep - 25 Sep	67	0	67	12	294	34	12
26 Sep - 29 Sep	29	0	29	12	176	36	20
30 Sep - 2 Oct	56	0	56	12	361	41	11
3 Oct - 6 Oct	9	0	9	13	52	15	29
7 Oct - 9 Oct	59	2	61	10	302	41	14
10 Oct - 13 Oct	22	0	22	12	76	15	20
14 Oct - 16 Oct	3	0	3	6	9	7	78
9 Sep - 16 Oct	271	8	279	113	1,440	88	6

Table 8. Number of angler interviews, angler counts, and estimates of angler-effort (hours) at the Steese Highway of the Chatanika River, Tanana River drainage, Alaska, 1988.

Stratum	Angler Interviews			Angler-Effort			
	Complete	Incomplete	Total	Counts	Hours	SE	CV(%)
Steese Highway							
9 Sep - 11 Sep	0	0	0	0	0	---	--
12 Sep - 15 Sep	0	0	0	0	0	---	--
16 Sep - 18 Sep	5	3	8	2	72	67	93
19 Sep - 22 Sep	3	1	4	4	24	22	92
23 Sep - 25 Sep	7	2	9	7	33	8	24
26 Sep - 29 Sep	6	0	6	4	48	20	42
30 Sep - 2 Oct	3	3	6	3	66	29	44
3 Oct - 6 Oct	5	1	6	6	36	14	39
7 Oct - 9 Oct	2	0	2	3	12	11	92
10 Oct - 13 Oct	1	0	1	4	6	5	83
14 Oct - 16 Oct	0	0	0	0	0	---	--
9 Sep - 16 Oct	32	10	42	33	297	82	28

Table 9. Estimates of HPUE (harvest-per-hour) and harvest of least cisco at the Chatanika River, Tanana River drainage, Alaska, 1988.

Stratum	Campground Area						Ditch Area					
	HPUE			Harvest			HPUE			Harvest		
	Mean	SE	CV(%)	Total	SE	CV(%)	Mean	SE	CV(%)	Total	SE	CV(%)
Least Cisco												
9 Sep - 11 Sep	0.433	0.173	40	13	7	54	0.000	---	--	0	---	--
12 Sep - 15 Sep	0.000	0.000	0	0	0	0	0.381	0.164	43	8	5	63
16 Sep - 18 Sep	0.469	0.084	18	25	7	28	0.465	0.127	27	23	9	39
19 Sep - 22 Sep	0.705	0.385	55	133	77	58	2.958	0.482	16	296	107	36
23 Sep - 25 Sep	0.220	0.033	15	85	16	19	1.553	0.134	9	456	65	14
26 Sep - 29 Sep	1.669	0.119	7	781	137	18	3.223	0.278	9	567	125	22
30 Sep - 2 Oct	0.647	0.090	14	227	64	28	2.949	0.294	10	1,063	161	15
3 Oct - 6 Oct	0.512	0.203	40	137	61	44	1.961	0.560	29	101	41	41
7 Oct - 9 Oct	0.049	0.019	39	15	6	40	1.636	0.163	10	495	83	17
10 Oct - 13 Oct	0.000	0.000	0	0	0	0	0.410	0.134	33	31	12	39
14 Oct - 16 Oct	0.000	0.000	0	0	0	0	0.000	0.000	0	0	0	0
9 Sep - 16 Oct	0.633	0.150	13	1,416	181	13	2.112	0.264	13	3,040	257	8

least cisco harvest was 4,456 fish; of which 32% (1,416 least cisco) were harvested in the campground area and 68% (3,040 least cisco) were harvested in the ditch area. No least cisco were harvested in the Steese Highway area.

The estimated HPUE of humpback whitefish in the campground area was 0.643 fish-per-hour, 1.113 fish-per-hour in the ditch area, and 1.786 fish-per-hour in the Steese Highway area (Table 10). Estimated humpback whitefish harvest for the areas combined was 3,571 fish. Forty percent or 1,437 of the humpback whitefish were harvested in the campground area, 45% or 1,603 humpback whitefish were harvested in the ditch area, and 15% or 531 humpback whitefish were harvested in the Steese Highway area.

The estimated HPUE of round whitefish in the campground area was 0.95 fish-per-hour and 0.061 fish-per-hour in the ditch area (Table 11). Total estimated round whitefish harvest in the Chatanika River was 299 fish. Of this, 71% or 212 round whitefish were harvested in the campground area and 29% or 87 round whitefish were harvested in the ditch area. No round whitefish were harvested in the Steese Highway area.

The combined harvest estimate for the Chatanika River was 8,326 whitefish (Tables 9, 10, 11). Thirty-seven percent (3,065 whitefish) of the whitefish were harvested in the campground area, 57% (4,730 whitefish) were harvested in the ditch area, and 6% (531 whitefish) were harvested in the Steese Highway area.

In this fishery, CPUE and catch are the same as HPUE and harvest.

Distribution of Angler Harvest:

Based upon 326 angler interviews in the campground area, 64% harvested no least cisco, 67% harvested no humpback whitefish, and 44% did not harvest any whitefish (Table 12). Of the anglers who harvested whitefish in the campground area, 63% of the least cisco were harvested by anglers who harvested five or fewer least cisco, 64% of the humpback whitefish were harvested by anglers who harvested five or fewer humpback whitefish, and 45% of all whitefish were harvested by anglers who harvested five or fewer whitefish combined. One angler that was interviewed in the campground area harvested over 15 whitefish, which was a violation of the 15 whitefish bag and possession limit.

Based upon 271 anglers interviewed in the ditch area, 24% of anglers harvested no least cisco, 44% harvested no humpback whitefish, and 9% did not harvest any whitefish (Table 13). Of the anglers who harvested whitefish in the ditch area, 23% of the least cisco were harvested by anglers who caught five or fewer least cisco, 52% of the humpback whitefish were harvested by anglers who harvested five or fewer humpback whitefish, and 17% of all whitefish were harvested by anglers who caught five or fewer whitefish. Eight anglers interviewed in the ditch area harvested over 15 whitefish.

Based upon 32 completed angler interviews at the Steese Highway, 34% of anglers harvested no humpback whitefish (Table 14). Of the anglers who harvested humpback whitefish, 32% of the humpback whitefish were harvested by

Table 10. Estimates of HPUE (harvest-per-hour) and harvest of humpback whitefish at the Chatanika River, Tanana River drainage, Alaska, 1988.

Stratum	Campground Area						Ditch Area						Steese Highway					
	HPUE			Harvest			HPUE			Harvest			HPUE			Harvest		
	Mean	SE	CV(%)	Total	SE	CV(%)	Mean	SE	CV(%)	Total	SE	CV(%)	Mean	SE	CV(%)	Total	SE	CV(%)
Humpback Whitefish																		
9 Sep - 11 Sep	0.291	0.181	62	9	6	67	0.000	---	--	0	--	--	0.000	---	--	0	---	--
12 Sep - 15 Sep	0.000	0.000	0	0	0	0	0.571	0.000	0	12	6	50	0.000	---	--	0	---	--
16 Sep - 18 Sep	0.173	0.043	25	9	3	33	0.836	0.247	30	41	18	44	0.000	0.000	0	0	0	0
19 Sep - 22 Sep	0.294	0.227	77	55	44	80	0.986	0.207	21	99	38	38	1.389	0.665	48	33	31	94
23 Sep - 25 Sep	0.034	0.010	29	13	4	31	0.171	0.030	18	50	11	22	0.253	0.098	39	8	4	50
26 Sep - 29 Sep	0.372	0.064	17	174	41	24	1.045	0.183	18	184	49	27	1.803	0.867	48	87	52	60
30 Sep - 2 Oct	0.555	0.203	37	194	84	43	1.370	0.181	13	495	86	17	4.418	0.467	11	292	131	45
3 Oct - 6 Oct	2.103	0.365	17	564	157	28	2.216	0.466	21	115	41	36	2.199	0.674	31	79	38	48
7 Oct - 9 Oct	0.757	0.080	11	238	36	15	1.171	0.112	10	354	58	16	2.000	0.408	20	24	22	92
10 Oct - 13 Oct	2.300	0.717	31	172	80	47	3.333	0.451	14	253	61	17	1.333	0.000	0	8	7	88
14 Oct - 16 Oct	0.120	0.075	63	9	6	67	0.000	0.000	0	0	0	0	0.000	---	--	0	---	--
9 Sep - 16 Oct	0.643	0.215	33	1,437	207	14	1.113	0.197	18	1,603	143	9	1.786	0.518	29%	531	151	28

Table 11. Estimates of HPUE (harvest-per-hour) and harvest of round whitefish at the Chatanika River, Tanana River drainage, Alaska, 1988.

Stratum	Campground Area						Ditch Area					
	HPUE			Harvest			HPUE			Harvest		
	Mean	SE	CV(%)	Total	SE	CV(%)	Mean	SE	CV(%)	Total	SE	CV(%)
Round Whitefish												
9 Sep - 11 Sep	0.000	0.000	0	0	0	0	0.000	---	--	0	---	--
12 Sep - 15 Sep	0.000	0.000	0	0	0	0	0.000	0.000	0	0	0	0
16 Sep - 18 Sep	0.222	0.066	30	12	4	33	0.047	0.035	74	2	2	100
19 Sep - 22 Sep	0.175	0.173	99	33	33	100	0.215	0.132	61	21	14	67
23 Sep - 25 Sep	0.010	0.005	50	4	2	50	0.019	0.007	37	6	2	33
26 Sep - 29 Sep	0.000	0.000	0	0	0	0	0.017	0.014	82	3	3	100
30 Sep - 2 Oct	0.012	0.010	83	4	4	100	0.055	0.023	42	20	9	45
3 Oct - 6 Oct	0.512	0.160	31	137	52	38	0.089	0.047	53	5	3	60
7 Oct - 9 Oct	0.028	0.010	36	9	3	33	0.064	0.026	41	19	8	42
10 Oct - 13 Oct	0.182	0.082	45	13	8	62	0.145	0.049	34	11	4	36
14 Oct - 16 Oct	0.000	0.000	0	0	0	0	0.000	0.000	0	0	0	0
9 Sep - 16 Oct	0.095	0.077	81	212	62	29	0.061	0.042	69	87	20	22

Table 12. Distribution of least cisco, humpback whitefish, and combined whitefish harvest among anglers interviewed at the campground area (Elliott Highway) of the Chatanika River, Tanana River drainage, Alaska, 1988.

Number of Fish	Least Cisco						Humpback Whitefish						Combined Whitefish[1]					
	Anglers			Harvest			Anglers			Harvest			Anglers			Harvest		
	n[2]	%	Cumm %	n[3]	%	Cumm %	n[2]	%	Cumm %	n[3]	%	Cumm %	n[2]	%	Cumm %	n[3]	%	Cumm %
0	208	64	64	0	0	0	217	67	67	0	0	0	143	44	44	0	0	0
1	30	9	73	30	8	8	43	13	80	43	12	12	43	13	57	43	5	5
2	26	8	81	52	13	21	19	6	86	38	10	22	26	8	65	52	6	12
3	25	8	89	75	19	40	16	5	90	48	13	36	33	10	75	99	12	24
4	11	3	92	44	11	52	8	2	93	32	9	44	15	5	80	60	7	32
5	9	3	95	45	12	63	7	2	95	35	10	54	22	7	87	110	14	45
6	3	1	96	18	5	68	3	1	96	18	5	59	8	2	89	48	6	51
7	3	1	97	21	5	73	2	1	97	14	4	63	5	2	90	35	4	56
8	4	1	98	32	8	81	0	0	97	0	0	63	6	2	92	48	6	62
9	3	1	99	27	7	88	2	1	97	18	5	68	5	2	94	45	6	67
10	0	0	99	0	0	88	3	1	98	30	8	76	3	1	95	30	4	71
11	2	1	99	22	6	94	1	0	98	11	3	79	1	0	95	11	1	72
12	2	1	100	24	6	100	0	0	98	0	0	79	7	2	97	84	10	83
13	0	0	100	0	0	100	0	0	98	0	0	79	1	0	98	13	2	85
14	0	0	100	0	0	100	0	0	98	0	0	79	2	1	98	28	3	88
15	0	0	100	0	0	100	5	2	100	75	21	100	5	2	100	75	9	97
21	0	0	100	0	0	100	0	0	100	0	0	100	1	0	100	21	3	100
Total	326			390			326			362			326			802		

[1] Includes least cisco, humpback whitefish, and round whitefish.
[2] Number of anglers interviewed (complete-trip only) that caught or harvested a certain number of whitefish.
[3] Number of whitefish caught or harvested by each group of anglers interviewed.

Table 13. Distribution of least cisco, humpback whitefish, and combined whitefish harvest among anglers interviewed at the ditch area (Elliott Highway) of the Chatanika River, Tanana River drainage, Alaska, 1988.

Number of Fish	Least Cisco						Humpback Whitefish						Combined Whitefish[1]					
	Anglers			Harvest			Anglers			Harvest			Anglers			Harvest		
	n[2]	%	Cumm %	n[3]	%	Cumm %	n[2]	%	Cumm %	n[3]	%	Cumm %	n[2]	%	Cumm %	n[3]	%	Cumm %
0	65	24	24	0	0	0	118	44	44	0	0	0	25	9	9	0	0	0
1	33	12	36	33	3	3	30	11	55	30	5	5	25	9	18	25	1	1
2	21	8	44	42	4	7	32	12	66	64	10	15	29	11	29	58	3	5
3	23	8	52	69	6	13	22	8	75	66	11	26	25	9	38	75	4	9
4	31	11	64	124	11	23	22	8	83	88	14	40	18	7	45	72	4	13
5	11	4	68	55	5	28	15	6	88	75	12	52	15	6	51	75	4	17
6	10	4	72	60	5	33	11	4	92	66	11	62	12	4	55	72	4	21
7	14	5	77	98	9	42	5	2	94	35	6	68	11	4	59	77	4	25
8	12	4	81	96	8	50	1	0	94	8	1	69	16	6	65	128	7	32
9	10	4	85	90	8	58	2	1	95	18	3	72	14	5	70	126	7	39
10	11	4	89	110	10	67	1	0	96	10	2	73	9	3	73	90	5	44
11	12	4	93	132	11	79	2	1	96	22	4	77	11	4	77	121	7	51
12	7	3	96	84	7	86	2	1	97	24	4	81	10	4	81	120	7	57
13	3	1	97	39	3	90	2	1	98	26	4	85	10	4	85	130	7	64
14	0	0	97	0	0	90	0	0	98	0	0	85	5	2	87	70	4	68
15	8	3	100	120	10	100	3	1	99	45	7	92	28	10	97	420	23	91
16	0	0	100	0	0	100	1	0	99	16	3	95	3	1	98	48	3	94
17	0	0	100	0	0	100	2	1	100	34	5	100	2	1	99	34	2	96
19	0	0	100	0	0	100	0	0	100	0	0	100	1	0	99	19	1	97
26	0	0	100	0	0	100	0	0	100	0	0	100	1	0	100	26	1	98
28	0	0	100	0	0	100	0	0	100	0	0	100	1	0	100	28	2	100
Total	271			1,152			271			627			271			1,814		

[1] Includes least cisco, humpback whitefish, and round whitefish.

[2] Number of anglers interviewed (complete-trip only) that caught or harvested a certain number of whitefish.

[3] Number of whitefish caught or harvested by each group of anglers interviewed.

Table 14. Distribution of humpback whitefish harvest among anglers interviewed at the Steese Highway of the Chatanika River, Tanana River drainage, Alaska, 1988.

Number of Fish	Anglers			Harvest		
	n	%	Cumm %	n	%	Cumm %
0	11	34	34	0	0	0
1	6	19	53	6	6	6
2	3	9	63	6	6	11
3	3	9	72	9	8	20
4	2	6	78	8	8	27
5	1	3	81	5	5	32
6	0	0	81	0	0	32
7	0	0	81	0	0	32
8	1	3	84	8	8	40
9	1	3	88	9	8	48
10	1	3	91	10	9	58
11	0	0	91	0	0	58
12	0	0	91	0	0	58
13	0	0	91	0	0	58
14	0	0	91	0	0	58
15	3	9	100	45	42	100
Total	32			106		

[1] Includes least cisco, humpback whitefish, and round whitefish.
[2] Number of anglers interviewed (complete-trip only) that caught or harvested a certain number of whitefish.
[3] Number of whitefish caught or harvested by each group of anglers interviewed.

anglers who harvested five or fewer humpback whitefish. No anglers harvested over 15 humpback whitefish.

Estimates of percent age composition, Relative Stock Density, and mean fork length-at-age were not obtained for harvest samples because no significant difference was found between these estimates from tagging and from the harvest in 1987 (Hallberg 1988). Estimates of percent age composition, Relative Stock Density and mean fork length-at-age are presented in Hallberg (in prep.).

Demographic Profiles and Angler Opinions:

Angler demographics in the three spear fishing areas were almost identical. For this reason the angler demographics from the three areas were combined. Of the 692 anglers interviewed at the three areas of the Chatanika River, the typical angler was male (85%), adult (92%), a resident of Alaska, from the Fairbanks-North Pole area (98%), and used spears to harvest whitefish (100%) (Table 15). However, angler opinions were found to differ between the spear fishing areas.

The anglers interviewed at the campground area gave the spear fishing a rating of 3.84 or fair to poor (Table 16). Eighty-seven percent of the anglers who had opinions approved of the 15 whitefish daily bag and possession limit. Of the anglers who disapproved of the 15 whitefish bag and possession limit, 92% wanted it increased to more than 30 whitefish.

In contrast to the campground area, the anglers interviewed at the ditch area gave the spear fishing a mean rating of 2.10 or a good rating (Table 17).

Anglers interviewed at the Steese Highway gave the fishery a mean rating of 2.18 or a good rating (Table 18). Also, all of the 38 anglers that were interviewed approved of the 15 whitefish daily bag limit (Table 18).

The whitefish harvest for the Chatanika River spear fishery in 1988 was estimated to be 8,326 fish, compared to 28,591 fish in 1987 (Baker 1988). This was a 71% reduction in whitefish harvest from 1987 to 1988. The majority of the reduction was in the least cisco harvest. The harvest estimate for least cisco was 23,735 fish in 1987 and 4,456 fish in 1988. This was a 81% reduction in least cisco harvest from 1987 to 1988. However, humpback whitefish harvest only shifted from 4,577 fish in 1987 to 3,571 fish in 1988, which was a 22% reduction in humpback whitefish harvest. These reductions were the result of the 15 whitefish daily bag and possession limit instituted in 1988. Based on the distribution of harvest among anglers in 1987, it was predicted that the 15 whitefish bag limit would reduce harvest by 70% (Baker 1988); which was almost identical to the 71% that harvest was actually reduced.

The 15 whitefish bag limit was instituted in 1988 because of the high exploitation rates. Based on harvest estimates from the creel census and population abundance estimates from Hallberg (in prep.), exploitation rate for least cisco was 3% and 9% for humpback whitefish.

Table 15. Demographic profile of anglers interviewed at the Chatanika River (combined areas), Tanana River drainage, Alaska, 1988.

Angler Characteristic	n[1]	%	SE (%)	Angler Characteristic	n[1]	%	SE (%)
Total Number of Interviews[2]	692	--	--	Local[3]	612	98	1
				Non-local	11	2	1
Male	584	85	1	Tourist	0	0	0
Female	101	15	1	Other	692	100	0
Adult	630	92	1	Gear Type:			
Youth	54	8	1	Spears	692	100	--
Resident	623	92	1				
Non-Resident	8	1	0				
Military	50	7	1				

[1] Number of anglers in the categories will not always equal the total number of interviews because angler demographics were not marked down for all the anglers interviewed.

[2] Includes both complete- and incomplete-trip angler interviews combined.

[3] Local and non-local category includes Alaska residents only. Local category are anglers from the Fairbanks-North Pole area.

Table 16. Opinions of anglers interviewed at the campground area (Elliott Highway) of the Chatanika River, Tanana River drainage, Alaska, 1988.

Question	Opinion	n	%[1]	SE (%)
1. How would you rate the quality of spear fishing at the Chatanika River this year?	Excellent (1)	0	0	--
	Good (2)	23	6	1
	Fair (3)	13	4	1
	Poor (4)	335	90	2
	Total	371		
	Mean Rating = 3.84			
2. What is your opinion of the 15 whitefish daily bag and possession limit for the Chatanika River?	Approve	294	87	2
	Disapprove	43	13	2
	No Opinion	28	--	--
	Total	365		
3. If you disapprove of the whitefish limit. What should be the daily bag and possession limit for the whitefish in the Chatanika River?	More than 30	35	92	4
	15 to 30	0	0	--
	less than 15	3	8	4
	Total	38		

[1] Percentages are calculated for anglers with opinions only and do not take into account anglers in the no-opinion category.

Table 17. Opinions of anglers interviewed at the ditch area (Elliott Highway) of the Chatanika River, Tanana River drainage, Alaska, 1988.

Question	Opinion	n	%[1]	SE (%)
1. How would you rate the quality of spear fishing at the Chatanika River this year?	Excellent (1)	66	27	3
	Good (2)	113	46	3
	Fair (3)	42	17	2
	Poor (4)	24	10	2
	Total	245		
	Mean Rating = 2.10			
2. What is your opinion of the 15 whitefish daily bag and possession limit for the Chatanika River?	Approve	209	87	2
	Disapprove	31	13	2
	No Opinion	4	--	--
	Total	244		
3. If you disapprove of the whitefish limit. What should be the daily bag and possession limit for the whitefish in the Chatanika River?	More than 30	14	56	9
	15 to 30	11	44	9
	less than 15	5	--	--
	Total	30		

[1] Percentages are calculated for anglers with opinions only and do not take into account anglers in the no-opinion category.

Table 18. Opinions of anglers interviewed at the Steese Highway of the Chatanika River, Tanana River drainage, Alaska, 1988.

Question	Opinion	n	%[1]	SE (%)
1. How would you rate the quality of spear fishing at the Chatanika River this year?	Excellent (1)	4	12	6
	Good (2)	20	61	9
	Fair (3)	8	24	8
	Poor (4)	1	3	3
	Total	33		
	Mean Rating = 2.18			
2. What is your opinion of the 15 whitefish daily bag and possession limit for the Chatanika River?	Approve	38	100	0
	Disapprove	0	0	0
	No Opinion	0	--	--
	Total	38		
3. If you disapprove of the whitefish limit. What should be the daily bag and possession limit for the whitefish in the Chatanika River?	More than 30	0	0	0
	15 to 30	0	0	0
	less than 30	0	--	--
	Total	0		

[1] Percentages are calculated for anglers with opinions only and do not take into account anglers in the no-opinion category.

The creel census in 1988 was expanded to include the Steese Highway area. Anglers in the Steese Highway area accounted for 15% of the humpback whitefish harvest in the Chatanika River spear fishery. Based on the amount effort put forth for to provide this estimate, it is recommended that this portion of the creel census not be conducted in the future. However, this area should be checked periodically to make sure there are no dramatic shifts in angler-effort or harvest in the future. Elimination of the Steese Highway area from future creel censuses will make the harvest estimate for humpback whitefish a minimum estimate because a small portion of the harvest is being excluded.

CHAPTER 2 - UPPER CHENA RIVER ARCTIC GRAYLING FISHERY

Introduction

One of the largest Arctic grayling fisheries in Alaska occurs at the upper Chena River. This fishery attracts a large number of anglers because of its close proximity to Fairbanks and because the majority of the fishery is accessible by road (Figure 4). The upper Chena River fishery occurs mainly within the Chena River State Recreation Area. This is one of the first open-water fisheries to open during the spring within the Fairbanks area. The early season fishery continues throughout the open-water period with the majority of the angling effort expended during the months of June, July, and August.

Some type of creel census has been conducted at the upper Chena River almost every year since 1970 (Holmes 1985). Angler effort has ranged from 22,657 angler-hours in 1975 to a low of 9,090 angler-hours in 1987 (Table 19). Both harvest (18,049) and HPUE (1.55 Arctic grayling per hour) peaked in 1974. Since 1981, both harvest and HPUE of Arctic grayling have declined. The mean length of harvested Arctic grayling for the past ten years has been 246 mm and the proportion of quality grayling (> 300 mm) has ranged from 10% to 30%. The relatively small mean length and decreased abundance of grayling are commonly commented on by anglers (Holmes 1985). For these reasons, a series a fishery management regulations were implemented at the upper Chena River grayling fishery that included:

1) a 12 inch minimum length limit for Arctic grayling;

2) a no-bait restriction on the upper Chena River; and

3) catch and release Arctic grayling fishing from 1 April to the first Saturday of June each year at the upper Chena River.

These regulations were put into effect in 1987 to help sustain the declining Arctic grayling stock of the upper Chena River and still provide angling opportunity. There are indications that the management regulations are working. Harvest declined drastically from 16,390 in 1980 to a low of 1,260 in 1987. HPUE during the same time period dropped from 0.80 fish-per-hour to 0.14 fish-per-hour in 1987. However, in 1988, HPUE was the same as in 1987 and harvest increased slightly. Also, catch increased from 1986 to 1987, with catch decreasing slightly in 1988.

To provide a diversity of angling opportunities within the Tanana River drainage, a section of the upper Chena River from the confluence of the South Fork of the Chena River (river kilometer 128) upstream to the first bridge on the Chena Hot Springs Road (river kilometer 147) was designated as catch-and-release fishing in 1988. Because of the current management regulations and this new catch-and-release area, a creel census was conducted on the upper Chena River in 1988. The specific objectives of this creel census were to:

1) estimate the amount angler-effort expended at the upper Chena River;

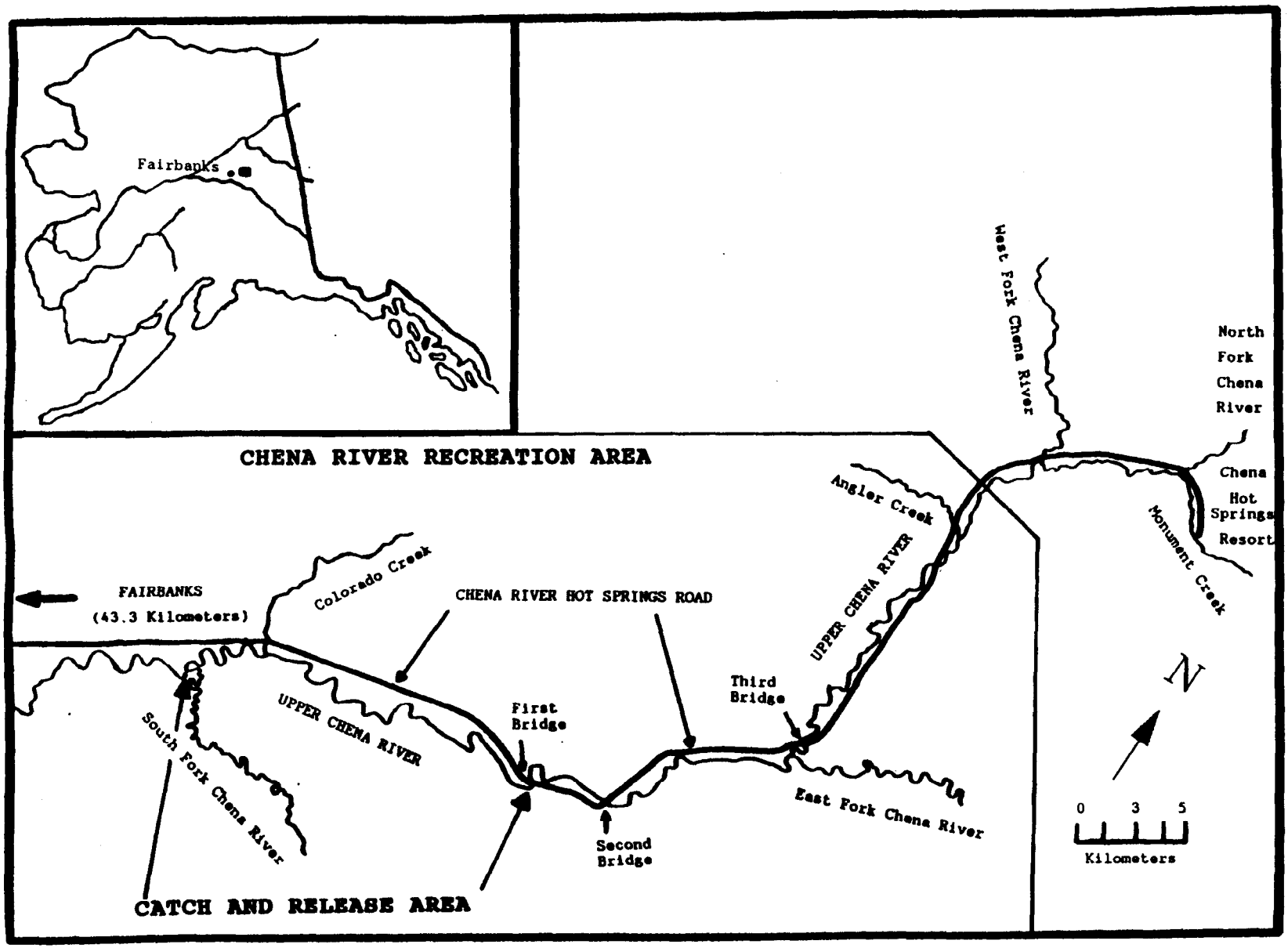

Figure 4. Map of the upper Chena River, Tanana River drainage, Alaska.

Table 19. Summary of creel census results for the upper Chena River Arctic grayling fishery, 1970-1988.

Year[1]	Date	Days	Angler Effort[2]	HPUE[3]	CPUE[4]	Harvest	Catch
1970	1 May - 31 May 14 Jul - 29 Aug	78	12,518	0.54	---	6,770	---
1972	25 May - 27 Aug	95	13,116	0.77	---	10,099	---
1974	1 Jul - 31 Aug	62	11,680	1.55	---	18,049	---
1975[5]	1 Jun - 31 Aug	92	22,657	0.62	---	14,067	---
1976	1 Jun - 31 Aug	92	10,752	0.39	---	4,161	---
1977	1 Jun - 31 Aug	92	13,536	0.69	---	9,406	---
1978	29 May - 31 Aug	95	10,508	0.65	---	6,898	---
1979	1 Jun - 31 Aug	92	12,744	0.82	---	10,459	---
1980	8 May - 30 Sep	144	20,827	0.78	---	16,390	---
1981	1 May - 31 Aug	123	15,896	0.80	---	13,549	---
1982	1 May - 15 Sep	138	20,379	0.62	---	12,603	---
1983	1 May -15 Sep	138	19,018	0.58	---	10,821	---
1984	6 May - 15 Sep	132	17,090	0.59	---	9,623	---
1985	8 May - 5 Sep	121	10,613	0.22	---	2,335	---
1986	1 May - 15 Sep	138	10,716	0.31	0.48	3,326	5,148
1987[6]	18 May - 15 Sep	121	9,090	0.14	0.78	1,260	6,997
1988	14 May - 18 Sep	128	11,763	0.14	0.57	1,583	6,714

[1] Data prior to 1982 from Hallberg (1982).
[2] Number of angler-hours.
[3] Number of Arctic grayling caught and kept per hour.
[4] Number of Arctic grayling caught per hour.
[5] Daily bag limit for Arctic grayling was reduced from 10 fish to 5 fish.
[6] Management regulations were initiated prior to this fishing season that included: (1) Catch and release Arctic grayling from 1 April to the first Saturday in June; (2) A 12 inch minimum length limit; and (3) A no-bait restriction (flies and lures only).

2) estimate CPUE, HPUE, catch, and harvest for Arctic grayling at the upper Chena River;

3) estimate percent age composition, Relative Stock Density (RSD), mean fork length-at-age for each age class of Arctic grayling in the harvest sample from the upper Chena River;

4) estimate the percent composition of angler demographics for the upper Chena River that include: a) male/female, b) adult/youth, c) resident/non-resident/military, d) local/non-local, e) tourist/other, and f) terminal fishing gear (spinner/bait/flies/jigs/trolling/ spear/bow and arrow);

5) estimate the percent response (opinions) to questions asked anglers at the upper Chena River; and,

6) estimate the mean rating of the fishery.

Methods

The upper Chena River grayling fishery occurs along a 43.3 km section of the Chena Hot Springs Road that parallels the Chena River (Figure 4). Numerous access points are available to anglers including eight bridges, three state campsites, and four access roads. Approximately 90% of the angler-effort occurs from shore near these access sites (Holmes 1981). A small proportion of anglers reach the more remote areas by floating between the access points. Within this area is a section of the river from the confluence of the South Fork of the Chena River (river kilometer 128) upstream to the first bridge on the Chena Hot Springs Road (river kilometer 147) that is designated as catch-and-release only for Arctic grayling.

The Chena River Arctic grayling creel census was a roving creel census that was conducted from 14 May through 18 September 1988. Holmes (1981) found that 83% of the fishing effort occurred between 0800 and 2200 hours on the upper Chena River. For this reason, the angling day was considered to be 14 hours long. Each month was divided into four time strata: (1) weekdays 1100 to 1900 hours; (2) weekdays 0800 to 1100 hours, and 1900 to 2200 hours; (3) weekends and holidays 1100 to 1900 hours; and (4) weekends and holidays 0800 to 1100 hours, and 1900 to 2200 hours. Based upon proportional allocation, 40%, 30%, 17%, and 13% of monthly sampling effort was expended in strata 1, 2, 3, and 4, respectively.

Thirty samples were collected during each monthly period. These samples were distributed among the four strata as described above. The sample period for the upper Chena River harvest survey was two hours. The field procedure was as follows. At the start of a two-hour sampling period, a coin was tossed to determine if an angler count or angler interviews were conducted first. Angler counts were made by driving the main road and all side roads on which anglers were located within the 43.3 km section. Angler counts took approximately 40 minutes to complete. The remainder of the sample period was spent conducting angler interviews. Complete-trip interviews were preferred.

However, the majority of the anglers interviewed were interviewed while they were still fishing (incomplete-trip).

The harvest was also sampled while interviewing anglers. To meet the objective criteria, biological information was to be collected from 305 Arctic grayling. This number was calculated by applying a finite sampling correction factor (Equation 4.3 in Cochran 1977) to the sample size (403) provided by Thompson (1987). The correction factor was based upon 1987 harvest estimate at the upper Chena River of 1,260 Arctic grayling (Baker 1988).

Results and Discussion

The upper Chena River Arctic grayling creel began on 14 May and continued through 18 September 1988. During this time, 115 angler counts were conducted along with 325 angler interviews. Of the anglers interviewed, 251 (77%) were still fishing and 74 (23%) had finished fishing (Table 20). Angler-effort was estimated to be 11,763 hours. The months of June (4 June to 1 July) and July (2 July to 29 July) accounted for 31% and 36% of the total angler-effort, respectively. Angler-effort was estimated inside and outside the catch-and-release area from 30 July through 18 September 1988. During this time, anglers spent 279 hours (15%) fishing inside the catch-and-release area, while 1,638 hours (85%) were spent fishing outside the catch-and-release area. Of the 60 anglers interviewed during this time, five were interviewed inside the catch-and-release area and 55 outside the area.

Catch-per-hour ranged from a low of 0.269 in June to a high of 0.953 in May (Table 21). Catch-per-hour for the entire creel census was 0.573. Harvest-per-hour peaked in August with 0.327 Arctic grayling being caught and kept per hour. Harvest-per-hour was 0.135 for the entire fishery. The total Arctic grayling catch and harvest was estimated to be 6,713 fish and 1,584 fish, respectively. July anglers accounted for 33% of catch and May anglers 28% of the catch. June and July anglers accounted for approximately 36% of the harvest. Catch-per-hour, HPUE, catch, and harvest were estimated during 30 July through 18 September 1988 inside and outside the catch-and-release area. Catch-per-hour was 0.985 inside and 0.835 outside the catch-release area (Table 21). Even though there should have been no harvest inside the catch-and-release area, HPUE was 0.985 inside and 0.315 outside the catch-and-release area. Catch and harvest were 114 fish inside the catch-and-release area while catch was 1,321 fish and harvest was 498 fish outside the area, respectively.

Fifty-seven percent of the anglers interviewed caught no Arctic grayling, while 77% did not harvest any (Table 22). Distribution of Arctic grayling catch and harvest showed that 93% of anglers interviewed caught five or fewer Arctic grayling, accounting for 52% of catch and 100% of the harvest. The most Arctic grayling caught by any angler interviewed was 17.

Biological data were collected from 34 Arctic grayling examined in the harvest from the upper Chena River. Age at harvest ranged from 3 to 10 years (Table 23). Age 5 Arctic grayling made up 50% of the harvest while 27% were age 6. Mean fork length for the entire harvest sample was 287 mm, which was approximately equal to an age 6 Arctic grayling. Quality size Arctic grayling

Table 20. Number of angler interviews, angler counts, and estimates of angler-effort (hours) at the upper Chena River, Tanana River drainage, Alaska, 1988.

Stratum	Angler Interviews			Angler-Effort			
	Complete	Incomplete	Total	Counts	Hours	SE	CV(%)
14 May - 3 Jun	12	27	39	20	1,974	438	22
4 Jun - 1 Jul	26	86	112	27	3,591	462	12
2 Jul - 29 Jul	21	93	114	29	4,200	593	14
30 Jul - 2 Sep	13	42	55	31	1,762	290	17
3 Sep - 10 Sep	2	3	5	8	236	70	30
14 May - 18 Sep	74	251	325	115	11,763	920	8
Catch and Release Area·							
30 Jul - 18 Sep	2	3	5	39	279	84	30
Outside Catch and Release Area							
30 Jul - 18 Sep	13	42	55	38	1,638	273	17

Table 21. Estimates of CPUE (catch-per-hour), HPUE (harvest-per-hour), catch, and harvest of Arctic grayling at the upper Chena River, Tanana River drainage, Alaska, 1988.

Stratum	CPUE			HPUE			Catch			Harvest		
	Mean	SE	CV(%)	Mean	SE	CV(%)	Total	SE	CV(%)	Total	SE	CV(%)
14 May - 3 Jun	0.953	0.891	94	0.010	0.016	169	1,881	941	50	19	20	104
4 Jun - 1 Jul	0.269	0.124	46	0.159	0.010	62	965	285	29	573	228	30
2 Jul - 29 Jul	0.531	0.258	49	0.090	0.048	53	2,230	557	25	380	114	30
30 Jul - 2 Sep	0.842	0.314	37	0.327	0.207	63	1,483	389	26	576	208	36
3 Sep - 10 Sep	0.856	0.395	46	0.200	0.000	0	154	46	30	36	0	0
14 May - 10 Sep	0.573	0.424	74	0.135	0.101	75	6,714	1,196	18	1,583	330	21
Catch and Release Area												
30 Jul - 18 Sep	0.985	0.000	0	0.985	0.000	0	114	75	66	114	75	66
Outside Catch and Release Area												
30 Jul - 18 Sep	0.835	0.331	40	0.315	0.205	65	1,321	312	24	498	189	38

Table 22. Distribution of Arctic grayling catch and harvest among anglers interviewed at the upper Chena River, Tanana River drainage, Alaska, 1988.

Number of Fish	Catch						Harvest					
	n[1]	%	Cumm %	n[2]	%	Cumm %	n[1]	%	Cumm %	n[2]	%	Cumm %
0	42	57	57	0	0	0	57	77	77	0	0	0
1	11	15	72	11	9	9	8	11	88	8	18	18
2	5	7	79	10	8	17	2	3	91	4	9	27
3	2	3	82	6	5	22	1	1	92	3	7	34
4	2	3	85	8	6	28	1	1	93	4	9	43
5	6	8	93	30	24	52	5	7	100	25	57	57
6	3	4	97	18	14	66						
13	1	1	98	13	10	76						
14	1	1	99	14	11	87						
17	1	1	100	17	13	100						
Total	74			127			74			44		

[1] Number of anglers interviewed (complete-trip only) that caught or harvested a certain number of Arctic grayling.

[2] Number of Arctic grayling caught or harvested by each group of anglers interviewed.

Table 23. Estimates of the contributions of each age class, mean fork length (mm) at age, and Relative Stock Density (RSD) of Arctic grayling in the harvest sample from the upper Chena River, Tanana River drainage, Alaska, 1988.

	Age Composition			Fork Length[1]		Relative Stock Density (RSD)				
Age	n	%	SE (%)	Mean	SE	Category	Range	n	%	SE (%)
3	1	3	3	190	--	Stock	150-269	13	38	9
4	1	3	3	245	--	Quality	270-339	18	53	9
5	15	50	9	273	6	Preferred	340-449	3	9	5
6	8	27	8	297	9	Memorable	450-559	0	0	--
7	0	0	--	---	--	Trophy	750-up	0	0	--
8	2	7	5	333	23					
9	2	7	5	345	40	Total		34		
10	1	3	3	350	--					
Total	30			287	7					

[1] Fork length is in millimeters (mm).

made up the majority of the harvest at 53%, followed by stock size Arctic grayling at 38%, and preferred size at 9%. There were no Arctic grayling in the memorable or trophy size classes.

The majority of the anglers utilizing the upper Chena River Arctic grayling fishery in 1988 were male (75%), adult (80%), residents of the State of Alaska (89%), and live in Fairbanks-North Pole area (82%) (Table 24). Non-residents made up 24% of the anglers interviewed while 7% were military personnel. Eighteen percent of anglers interviewed were tourists. The most popular terminal gear type was spinners (48%), followed by flies (42%), jigs (9%), and bait (1%).

Anglers gave the upper Chena River Arctic grayling fishery a mean rating of 3.06, which is approximately a "fair" rating (Table 25). Of these anglers, 8% rated the fishery as excellent, 20% as good, 31% as fair, and 41% as poor. The majority of the anglers interviewed approved of the following: a 12 inch minimum length limit for Arctic grayling (84%); a no-bait restriction on the upper Chena River (76%); catch-and-release Arctic grayling fishing until the first Saturday in June (86%); and a catch-and-release only section for the upper Chena River (77%).

Table 24. Demographic profile of anglers interviewed at the upper Chena River, Tanana River drainage, Alaska, 1988.

Angler Characteristic	n[1]	%	SE (%)	Angler Characteristic	n[1]	%	SE (%)
Total Number of Interviews[2]	325	--	--	Local[3]	186	82	3
				Non-local	40	18	3
Male	243	75	2	Tourist	57	18	2
Female	82	25	2	Other	268	82	2
Adult	259	80	2	Gear Type:			
Youth	66	20	2	Spinners	148	48	3
				Flies	129	42	3
Resident	226	69	3	Jigs	28	9	2
Non-Resident	77	24	2	Bait	2	1	1
Military	22	7	1				

[1] Number of anglers in the categories will not always equal the total number of interviews because angler demographics were not marked down for all the anglers interviewed.

[2] Includes both complete- and incomplete-trip angler interviews combined.

[3] Local and non-local category includes Alaska residents only. Local category are anglers from the Fairbanks-North Pole area.

Table 25. Opinions of anglers interviewed at the upper Chena River, Tanana River drainage, Alaska, 1988.

Question	Opinion	n	%[1]	SE(%)
1. How would you rate the quality of Arctic grayling fishing at the upper Chena River this year?	Excellent (1)	14	8	3
	Good (2)	37	20	4
	Fair (3)	58	31	4
	Poor (4)	76	41	5
	Total	185		
	Mean Rating = 3.06			
2. What is your opinion of a 12 inch minimum length limit for Arctic grayling in the upper Chena River?	Approve	175	84	3
	Disapprove	34	16	3
	No Opinion	10	--	--
	Total	219		
3. What is your opinion of restricting the use of bait in the upper Chena River (only artificial flies and lures may be used)?	Approve	158	76	3
	Disapprove	49	24	3
	No Opinion	11	--	--
	Total	218		
4. What is your opinion of catch and release only for Arctic grayling in the upper Chena River until the first Saturday in June?	Approve	180	86	2
	Disapprove	29	14	2
	No Opinion	9	--	--
	Total	218		
5. What is your opinion of designating the section of the upper Chena River from the confluence of the South Fork upstream to the 1st bridge as catch and release fishing only for Arctic grayling?	Approve	153	77	3
	Disapprove	45	23	3
	No Opinion	21	--	--
	Total	219		

[1] Percentages are calculated for anglers with opinions only and do not take into account anglers in the no-opinion category.

CHAPTER 3 - LOWER CHENA RIVER CHINOOK SALMON FISHERY

Introduction

The lower 72 km of the Chena River supports a chinook salmon fishery (Figure 5). Public access to the fishery is available at several locations from Pike's Landing (river kilometer 3.2) to the Chena River Park State Recreational Area (river kilometer 67). Since 1978, at least 25 chinook salmon have been harvested annually with harvests increasing to 212 in 1986 and 195 in 1987 (Mills 1979-1988).

In 1986, the area open to salmon fishing was lengthened to include approximately 42 additional river kilometers between the confluence of the little Chena River upstream to the Chena River Dam site (Figure 5). A significant increase in fishing effort has resulted. For this reason, a preliminary creel census was conducted on the lower Chena River chinook salmon fishery in 1987. In 1987, forty-two anglers were interviewed during the fishery. CPUE and HPUE was estimated to be 0.022 and 0.009 chinook salmon per hour, respectively (Baker 1988).

The creel census was expanded in 1988 to estimate CPUE, HPUE, catch, and harvest of chinook salmon in the lower Chena River. The creel census also provided an opportunity to examine chinook salmon in the harvest sample for tags and fin-clips. Commercial Fish Division has been tagging chinook salmon in the lower Chena River since 1986 as part of a chinook salmon escapement project (Barton 1987-1989). The specific objectives of the lower Chena River creel census were to:

1) estimate the amount angler-effort expended at the lower Chena River;

2) estimate CPUE, HPUE, catch, and harvest for chinook salmon at the lower Chena River;

3) estimate the percent composition of angler demographics for the lower Chena River that include: a) male/female, b) adult/youth, c) resident/non-resident/military, d) local/ non-local, e) tourist/other, and f) terminal fishing gear (spinner/bait/flies/jigs/trolling/ spear/bow and arrow); and,

4) estimate the percent response (opinions) to questions asked anglers at the lower Chena River.

Methods

The lower Chena River chinook salmon fishery occurred primarily in two areas: Area 1 - from Wendell Street Bridge to one-half kilometer above Nordale Street Bridge; and Area 2 - 2 km below the Chena River Dam Site upstream to the Dam Site. Because there were two areas, the creel census was actually two separate surveys. Both areas were creel censused with a roving harvest survey. The surveys were conducted during the month of July. The fishery was stratified into (1) weekdays, and (2) weekends/holidays. The fishing day was defined to occur from 0600 hours to 2400 hours each day.

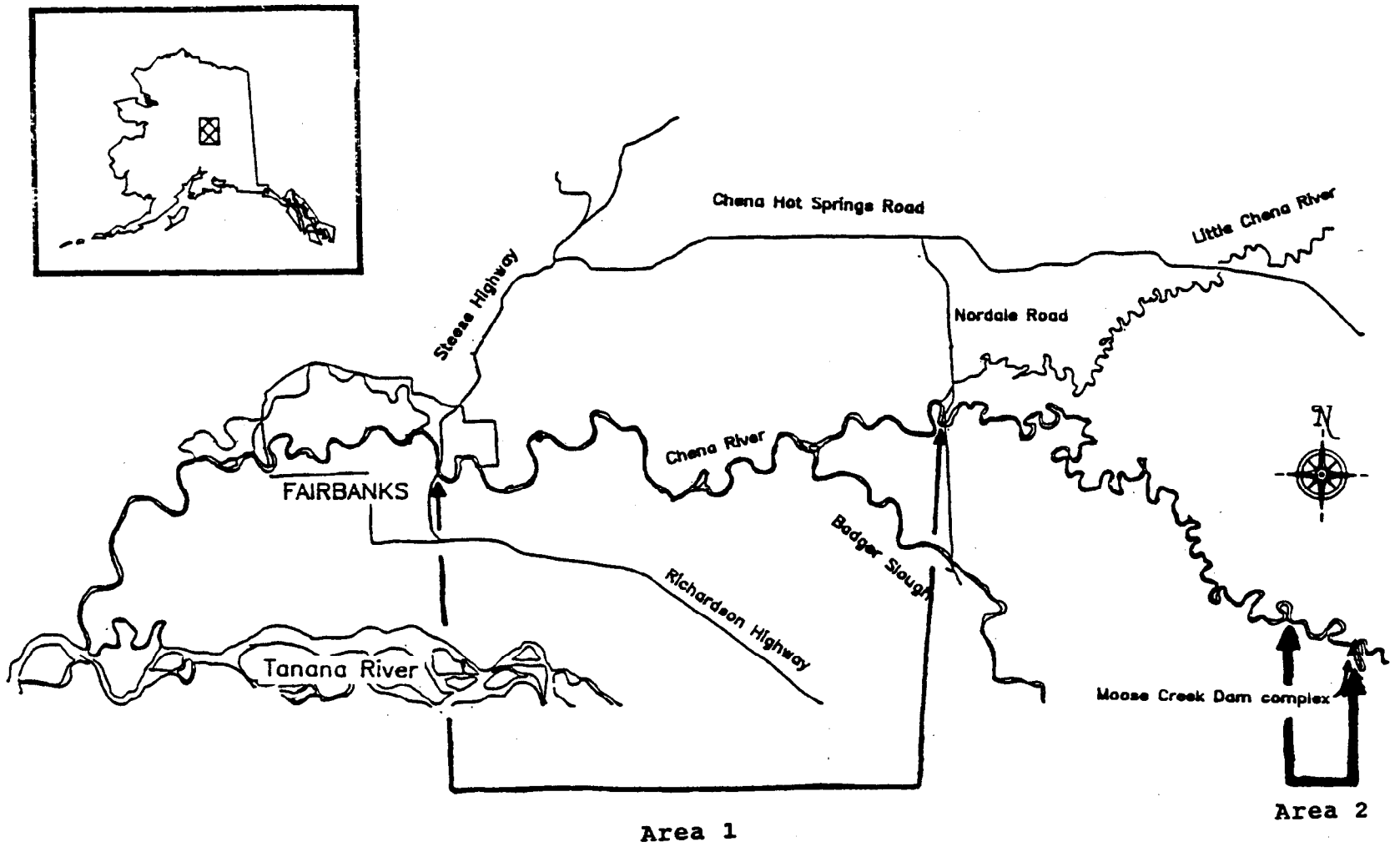

Figure 5. Map of the lower Chena River, Tanana River drainage, Alaska.

Approximately 10 sample periods were randomly chosen for sampling during each week of the month of July. Sample periods were allocated equally between the two areas. Sample periods within each area were allocated proportionally to weekday/weekend strata based upon the amount of time in each strata.

The sample period for Area 1 was four hours. The sampling procedure for Area 1 started with the creel clerk putting the boat in at the lagoon located on Fort Wainwright. The clerk would make an angler count by driving the boat from Wendell Street Bridge upstream to Nordale Street Bridge. The count would take approximately 40 minutes to complete. The clerk would then spend approximately one hour interviewing anglers at the Nordale Street Bridge. The clerk would then drive the boat downstream to make a second count. The clerk finished the sample period by interviewing anglers on Fort Wainwright near the Commercial Fish Division test net site (Barton 1989).

The sample period for Area 2 was two hours. The sample period started with the creel clerk conducting an angler count by driving a boat downstream from the Dam Site two river kilometers. The clerk would then return to the Dam Site to interview anglers in the area. The clerk would make a second angler count during the middle of sample period and finish the sample period by interviewing anglers near the Dam Site.

All chinook salmon encountered in both areas during the fishery were sexed, measured for fork length (mm), and checked for tags and fin clips. In addition, scales were collected that would be subsequently examined to estimate age.

Results and Discussion

The lower Chena River harvest survey was conducted 2 July through 29 July 1988. Seventy-six angler counts were made in the two areas, with 36 in Area 1 and 40 in Area 2 (Table 26). An estimated 8,544 hours were spent fishing in the two areas. Of which, 6,916 hours or 81% were from anglers in Area 1 and 1,628 or 19% were from anglers in Area 2. Two-hundred and five anglers were interviewed within the two areas. One-hundred-sixty four were interviewed in Area 1 and 42 in Area 2. The majority of the anglers were interviewed while still fishing. Catch-per-hour and harvest-per-hour was 0.057 for Area 1, 0.299 for Area 2, and 0.091 for both areas combined (Table 27). Catch and harvest of chinook salmon was 363 in Area 1, 204 in Area 2, and 567 for the two areas combined.

Only 16 chinook salmon were examined in the harvest sample. Examining relative stock density (RSD), 63% were in the memorable length category and 25% in the preferred length category. No chinook salmon were of stock size and 6% were of quality size and 6% were trophy size (Table 28).

Anglers utilizing the lower Chena River chinook salmon fishery were primarily males (82%), adults (92%), and used spinners as their terminal angling gear (73%) (Table 29). Fifty-four percent of the anglers were military personnel, 8% were non-resident, and 38% were residents of the State of Alaska. Of the

Table 26. Number of angler interviews, angler counts, and estimates of angler-effort (hours) at the lower Chena River, Tanana River drainage, Alaska, 1988.

Stratum	Angler Interviews			Angler-Effort			
	Complete	Incomplete	Total	Counts	Hours	SE	CV (%)
Area 1 (Wendell Street Bridge to one-quarter mile above Nordale Street Bridge)							
2 Jul - 4 Jul	0	2	2	9	0	0	0
5 Jul - 8 Jul	2	5	7	3	504	215	43
9 Jul - 10 Jul	12	6	18	2	648	175	27
11 Jul - 15 Jul	9	29	38	8	1,496	289	19
16 Jul - 17 Jul	5	17	22	4	576	160	28
18 Jul - 22 Jul	7	38	45	9	2,610	633	24
23 Jul - 24 Jul	4	9	13	2	576	105	18
25 Jul - 29 Jul	0	19	19	8	506	173	24
2 Jul - 29 Jul	39	125	164	45	6,916	792	11
Area 2 (One and one-half miles below Dam Site to Dam Site)							
2 Jul - 4 Jul	0	0	0	1	540	---	---
5 Jul - 8 Jul	0	0	0	4	0	0	0
9 Jul - 10 Jul	0	0	0	7	144	62	43
11 Jul - 15 Jul	2	2	4	6	30	29	97
16 Jul - 17 Jul	0	0	0	4	0	0	0
18 Jul - 22 Jul	6	21	27	8	653	129	20
23 Jul - 24 Jul	0	5	5	2	126	52	41
25 Jul - 29 Jul	0	6	6	8	135	67	50
2 Jul - 29 Jul	8	34	42	40	1,628	169	10
Combined Areas							
2 Jul - 4 Jul	0	2	2	1	540	---	---
5 Jul - 8 Jul	2	4	6	7	504	215	43
9 Jul - 10 Jul	12	6	18	9	792	186	23
11 Jul - 15 Jul	11	31	42	14	1,526	291	19
16 Jul - 17 Jul	5	17	22	8	576	160	28
18 Jul - 22 Jul	13	59	72	17	3,263	646	20
23 Jul - 24 Jul	4	14	18	4	702	117	17
25 Jul - 29 Jul	0	25	25	16	641	186	29
2 Jul - 29 Jul	47	158	205	76	8,544	810	9

Table 27. Estimates of CPUE (catch-per-hour), HPUE (harvet-per-hour), catch, and harvest of chinook salmon at the lower Chena River, Tanana River drainage, Alaska, 1988.

Stratum	CPUE			HPUE			Catch			Harvest		
	Mean[1]	SE	CV (%)	Mean[1]	SE	CV (%)	Total	SE	CV (%)	Total	SE	CV(%)
Area 1 (Wendell Street Bridge to one-quarter mile above Nordale Street Bridge)												
2 Jul - 4 Jul	0.000	---	--	0.000	---	--	0	---	--	0	---	---
5 Jul - 8 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
9 Jul - 10 Jul	0.074	0.034	49	0.074	0.034	49	48	25	52	48	25	52
11 Jul - 15 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
16 Jul - 17 Jul	0.000	0.000	96	0.000	0.000	0	0	0	0	0	0	0
18 Jul - 22 Jul	0.102	0.084	82	0.102	0.084	82	267	221	83	267	221	83
23 Jul - 24 Jul	0.083	0.083	99	0.083	0.083	99	48	48	100	48	48	100
25 Jul - 29 Jul	0.000	---	--	0.000	---	--	0	---	--	0	--	---
2 Jul - 29 Jul	0.057	0.060	105%	0.057	0.060	105	363	228	63	363	228	63
Area 2 (One and one-half miles below Dam Site to Dam Site)												
2 Jul - 4 Jul	0.000	---	--	0.000	---	--	0	---	---	0	---	---
5 Jul - 8 Jul	0.000	---	--	0.000	---	--	0	---	---	0	---	---
9 Jul - 10 Jul	0.000	---	--	0.000	---	--	0	---	---	0	---	---
11 Jul - 15 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
16 Jul - 17 Jul	0.000	---	--	0.000	---	--	0	---	--	0	---	---
18 Jul - 22 Jul	0.312	0.114	37	0.312	0.114	37	204	83	41	204	83	41
23 Jul - 24 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
25 Jul - 29 Jul	0.000	---	--	0.000	---	--	0	---	--	0	---	---
2 Jul - 29 Jul	0.299	0.112	37	0.299	0.112	37	204	83	41	204	83	41
Combined Areas												
2 Jul - 4 Jul	0.000	---	--	0.000	---	--	0	---	---	0	---	---
5 Jul - 8 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
9 Jul - 10 Jul	0.074	0.032	43	0.074	0.032	43	48	25	52	48	25	52
11 Jul - 15 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
16 Jul - 17 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
18 Jul - 22 Jul	0.168	0.080	48	0.168	0.080	48	471	237	50	471	237	50
23 Jul - 24 Jul	0.083	0.082	98	0.083	0.082	98	48	48	100	48	48	100
25 Jul - 29 Jul	0.000	---	--	0.000	---	--	0	---	---	0	---	---
2 Jul - 29 Jul	0.091	0.060	66	0.091	0.060	66	567	242	43	567	242	43

[1] CPUE and HPUE were calculated for completed angler interviews only.

Table 28. Relative Stock Density (RSD) of chinook salmon from the harvest sample at the lower Chena River, Tanana River drainage, Alaska, 1988.

Category	Range[1]	n	%	SE (%)
Stock	250-459	0	0	--
Quality	460-569	1	6	6
Preferred	570-749	4	25	11
Memorable	750-939	10	63	12
Trophy	940-above	1	6	6
Total		16		

[1] Range is the fork length range of the RSD category in mm.

Table 29. Demographic profile of anglers interviewed at the lower Chena River, Tanana River drainage, Alaska, 1988.

Angler Characteristic	n[1]	%	SE (%)	Angler Characteristic	n[1]	%	SE (%)
Total Number of Interviews[2]	205	--	--	Local[3]	108	98	1
				Non-local	2	2	1
Male	168	82	3	Tourist	1	1	1
Female	37	18	3	Other	204	99	1
Adult	188	92	2	Gear Type:			
Youth	17	8	2	Spinners	131	73	3
				Bait	47	26	3
Resident	110	54	3	Flies	1	1	1
Non-Resident	16	8	2				
Military	79	38	3				

[1] Number of anglers in the categories will not always equal the total number of interviews because angler demographics were not marked down for all the anglers interviewed.

[2] Includes both complete- and incomplete-trip angler interviews combined.

[3] Local and non-local includes Alaska residents only. Local category are anglers from the Fairbanks-North Pole area.

anglers that were residents, 98% percent were from the Fairbanks-North Pole area. Only 1% of all the anglers interviewed were tourists.

The majority of the anglers interviewed were asked questions relating to management and quality of the lower Chena River chinook salmon fishery. The anglers gave the fishery a 2.86 rating, which is a fair to good rating (Table 30). Of the anglers interviewed, 12% rated the fishing excellent, 20% rated it good, 40% rated it fair, and 29% rated it poor. Ninety-four percent of the anglers interviewed knew the bag limit. One hundred percent thought public boat access was adequate. Ninety-six percent approved of using emergency regulations and season closures to manage the fishery. Ninety percent approved of stocking chinook salmon in the lower Chena River.

In the two areas, chinook salmon harvest was estimated to be 567. This estimate should be considered a minimum estimate for the lower Chena River because some fishing was known to occur outside the sample areas. However, the amount of fishing that occurred outside the areas was considered minimal. Spot checks were made during the creel census in areas outside Areas 1 and 2 and very little fishing occurred in these other areas. The harvest estimate of 567 chinook salmon represented almost a three fold increase in harvest over Mills (1987, 1988) estimates of 212 and 195 chinook salmon harvested in 1986 and 1987, respectively.

This type of increase should be of concern to managers in the future because harvest will most certainly increase in the near future unless some type of management action is taken. Possible alternatives could include a quota on the harvest, and/or the area open to fishing could be reduced back to the confluence of the little Chena River. This would eliminate the harvest in Area 2 and would have cut harvest by 36% in 1988.

Table 30. Opinions of anglers interviewed at the lower Chena River, Tanana River drainage, Alaska, 1988.

Question	Opinion	n	%[1]	SE (%)
1. How would you rate the quality of fishing for chinook salmon in the lower Chena River this year?	Excellent (1)	14	12	3
	Good (2)	24	20	4
	Fair (3)	48	40	4
	Poor (4)	35	29	4
	Total	121		
	Mean Rating = 2.86			
2. What is the bag limit for chinook salmon in the lower Chena River?	One	113	94	2
	Three	2	2	1
	Other	5	4	2
	Total	120		
3. Is public boat access adequate for the lower Chena River?	Yes	110	100	0
	No	0	0	0
	No-Opinion	11	---	---
	Total	121		
4. What is your opinion of using reduced seasons and emergency closures to manage chinook salmon in the lower Chena River?	Approve	112	96	2
	Disapprove	5	4	2
	No-Opinion	3	---	--
	Total	120		
5. What is your opinion of stocking chinook salmon in the lower Chena River?	Approve	104	90	3
	Disapprove	12	10	3
	No-Opinion	4	---	--
	Total	120		

[1] Percentages are calculated for anglers with opinions only and do not take into account anglers in the no-opinion category.

CHAPTER 4 - DELTA CLEARWATER RIVER ARCTIC GRAYLING FISHERY

Introduction

The Delta Clearwater River provides a popular Arctic grayling sport fishery. The river is located approximately 13 km northeast of Delta Junction (Figure 6). The main channel of the river is approximately 32 km long. The river drains an area of about 1,000 km^2. Public access to the river is available at the State of Alaska Clearwater Campground at river kilometer 13 and at the U.S. Army facility on Clearwater Lake (Figure 6).

Fishing begins on the Delta Clearwater River in mid to late May when the larger Arctic grayling begin to migrate to their summer feeding areas in the upper part of the river. From 1978 to 1987, an average of 6,558 angler days were expended annually to harvest an average of 5,698 Arctic grayling (Mills 1979-1988). In 1986, angler effort peaked at 10,137 angler days. However, in 1986, harvest dropped to its lowest level (2,343 fish) since 1977 (Mills 1979-1988). Because of concern for the fishery and the decline in harvest, emergency regulations were set forth on the Delta Clearwater River to protect the Arctic grayling stock(s) in 1987. These emergency regulations became permanent regulations in 1988. The regulations implemented were:

1) a 12 inch minimum length limit for Arctic grayling;

2) a no-bait restriction (only artificial flies and lures may be used); and,

3) catch and release Arctic grayling fishing from 1 April to the first Saturday of June each year.

To examine the effects of these new regulations, an on-site creel census was conducted on the Delta Clearwater River during 1986, and 1987. Angler-effort dropped from 5,481 hours in 1986 to 4,476 hours in 1987 (Clark and Ridder 1987, Baker 1988). At the same time, both HPUE and harvest increased, with Arctic grayling harvest going from 1,701 in 1986 to 1,838 in 1987 (Clark and Ridder 1987, Baker 1988).

A creel census was continued on the Delta Clearwater River during 1988. The long term goals of this creel census were to: (1) develop a historical database to allow the monitoring of both the recreational fishery and the exploited fish populations; (2) develop management regulations that reflect the desires of the angling public while ensuring the sustained health of the fish populations; and (3) evaluate the effect of management regulations and enhancement programs on the fishery. The specific objectives of the creel census were to:

1) estimate the amount angler-effort expended at the Delta Clearwater River;

2) estimate CPUE, HPUE, catch, and harvest for Arctic grayling at the Delta Clearwater River;

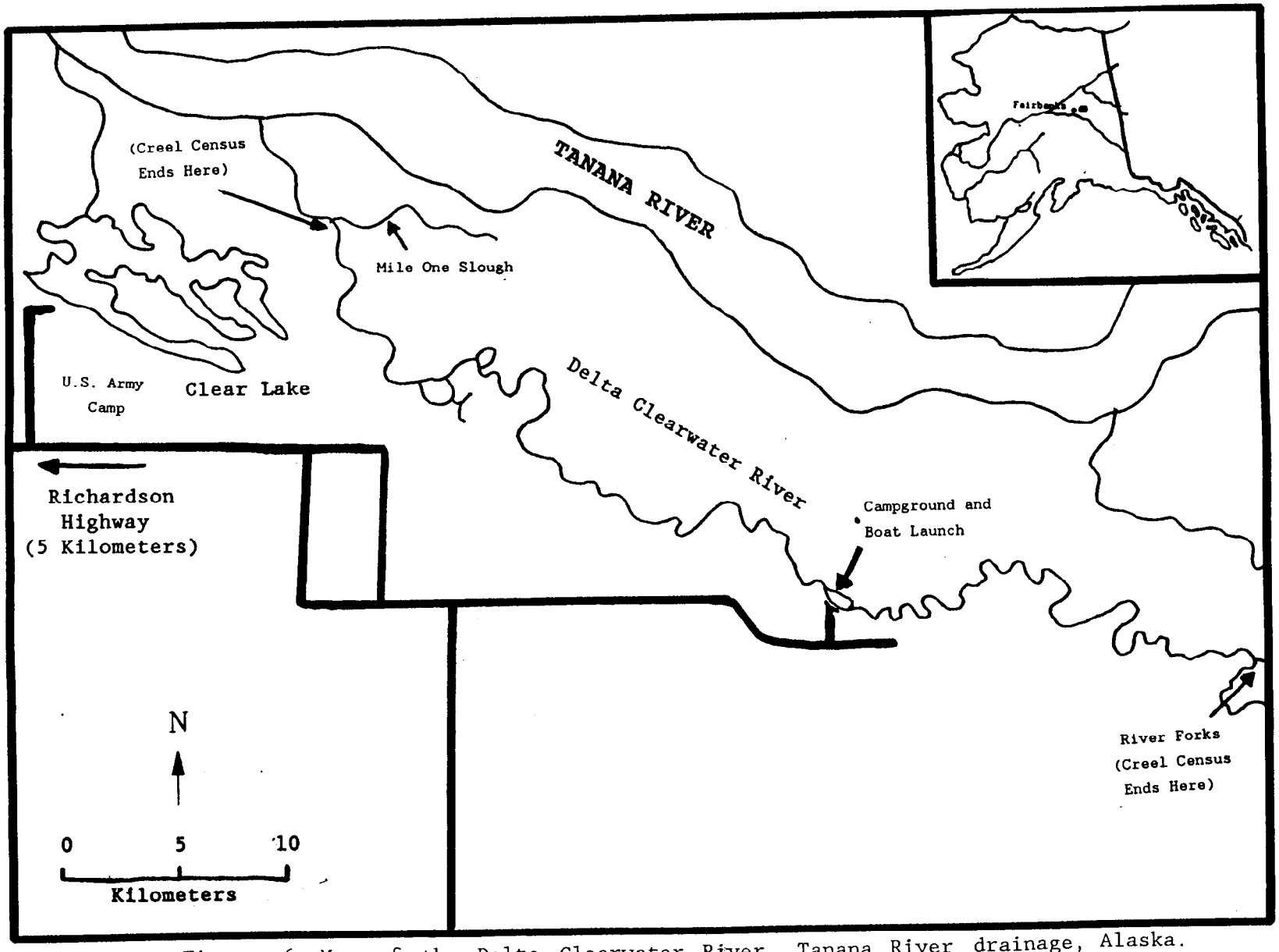

Figure 6. Map of the Delta Clearwater River, Tanana River drainage, Alaska.

3) estimate percent age composition, Relative Stock Density (RSD), mean fork length-at-age for each age class of Arctic grayling in the harvest sample from the Delta Clearwater River;

4) estimate the percent composition of angler demographics for the Delta Clearwater River that include: a) male/female, b) adult/youth, c) resident/non-resident/military, d) local/non-local, e) tourist/other, and f) terminal fishing gear (spinner/bait/flies/jigs/trolling/spear/bow and arrow);

5) estimate the percent response (opinions) to questions asked anglers at the Delta Clearwater River; and,

6) estimate the mean rating of the fishery.

Methods

Public access to the Delta Clearwater River is available at the State of Alaska Clearwater Campground and at the U.S. Army camp on Clear Lake (Figure 6). Approximately 50% of the angling effort is from shore based anglers who fish within 1.6 km of these access areas. The remainder of the effort is from anglers using river boats and cabin owners along the entire 32 km of the river. Ridder (1984) found that approximately 98% of the fishing effort occurs on the 32 km section of the mainstem Delta Clearwater River that is creel censused.

This creel census was a roving harvest survey. Fishing occurred on the Delta Clearwater River primarily between 0900 and 2100 hours. There were six monthly sampling strata: (1) weekdays 0900 to 1300 hours; (2) weekdays 1300 to 1700 hours; (3) weekdays 1700 to 2100 hours; (4) weekends and holidays 0900 to 1300 hours; (5) weekends and holidays 1300 to 1700 hours; (6) weekends and holidays 1700 to 2100 hours. Sampling effort was proportionally allocated to the strata based upon the amount of time in each strata. Based upon the amount of creel census time and variance estimates in previous years, 25% of the time in each strata was to be sampled. Therefore, 71.5% of the sampling time was expended equally to strata 1, 2, and 3; and 28.5% was equally distributed to strata 4, 5, and 6.

The Delta Clearwater River creel census was conducted from 4 June to 5 September 1988. Approximately twenty count and interview periods were sampled each month. The sample period for this harvest survey was four hours. Angler counts took approximately one hour to complete. The remainder of the four hour sample period was used to interview anglers. The majority of the anglers interviewed had completed fishing when interviewed.

The sampling procedure was as follows. At the start of a selected four hour sampling period, the creel clerk launched a boat at the Clearwater Campground (located in the middle of the creel census area). Whether the angler count or angler interviews were conducted first, and the direction (upstream or downstream) of sampling were determined by coin tosses. Angler counts were made in one direction and anglers were interviewed in the opposite direction. The same procedure was followed for the angler count and angler interviews in

the other half of the fishery. A typical example of the sample procedure was: (1) interview anglers above the campground while driving upstream; (2) count anglers above the campground while driving downstream; (3) interview anglers below the campground while driving downstream; and (4) count anglers below the campground while driving upstream. Angler counts in each direction take approximately 30 minutes to complete. The rest of the sampling period was spent at the campground interviewing anglers.

The harvest was also sampled while interviewing anglers. To meet the objective criteria, biological information was to be collected from 330 Arctic grayling. This number was calculated by applying a finite sampling correction factor (Equation 4.3 in Cochran 1977) to the sample size (403) provided by Thompson (1987). The correction factor was based on the 1987 harvest estimate at the Delta Clearwater River of 1,838 Arctic grayling (Baker 1988).

Results and Discussion

Seventy-four angler counts were conducted (Table 31). During the creel census, 253 anglers were interviewed, of which 178 were complete-trip interviews and 75 were incomplete-trip interviews. Estimated angler-effort was 4,433 hours with approximately equal effort expended during June, July, and August. Catch-per-hour (CPUE) was estimated to be 1.343 and harvest-per-hour (HPUE) was 0.751 (Table 32). An estimated 5,925 Arctic grayling were caught and 3,330 Arctic grayling harvested. Approximately half of the Arctic grayling were caught and harvested during June.

The distribution of angler catch and harvest shows that only 10% of the anglers interviewed caught no Arctic grayling (Table 33). Eighty-two percent of the anglers caught five or fewer Arctic grayling and accounted for 59% of the catch. No angler interviewed harvested more than five Arctic grayling. The most Arctic grayling caught by any angler was 17.

Biological data were collected from 451 Arctic grayling in the harvest sample. Harvested Arctic grayling ranged in age from 2 to 11 years (Table 34). Age 5 Arctic grayling made up 39% of the harvest sample. Eighty-one percent of the harvested Arctic grayling ranged from 3 to 8 years of age. The mean fork length of all Arctic grayling harvested was 326 mm, which was approximately the same length as an age 6 fish. Ninety-nine percent of the Arctic grayling in the harvest sample were in the quality and preferred length categories with no fish in the memorable or trophy length categories.

The majority of the anglers interviewed were male (79%), adult (83%), and residents of the State of Alaska (80%) (Table 35). Of the anglers interviewed that were residents, 65% were from outside the Delta Junction area. Non-residents and military personnel, respectively, made up 16% and 4% of the anglers interviewed. Twelve percent of the anglers interviewed were tourists. Most of anglers interviewed used flies (48%) or spinners (42%) as their terminal gear type with the rest using jigs (10%).

Anglers interviewed at the Delta Clearwater River gave the fishery a rating of 1.98 or "Good" rating (Table 36). Of these, 36% rated the fisher excellent, 38% rated it good, 19% rated it fair, and 7% rated it poor. The majority of

Table 31. Number of angler interviews, angler counts, and estimates of angler-effort (hours) at the Delta Clearwater River, Tanana River drainage, Alaska, 1988.

Stratum	Angler Interviews			Angler-Effort			
	Complete	Incomplete	Total	Counts	Hours	SE	CV (%)
4 Jun - 1 Jul	68	20	87	24	1,578	202	13
2 Jul - 29 Jul	60	32	92	24	1,401	176	13
30 Jul - 5 Sep	50	23	72	26	1,454	243	17
4 Jun - 5 Sep	178	75	253	74	4,433	362	8

Table 32. Estimates of CPUE (catch-per-hour), HPUE (harvest-per-hour), catch, and harvest of Arctic grayling at the Delta Clearwater River, Tanana River drainage, Alaska, 1988.

Stratum	CPUE			HPUE			Catch			Harvest		
	Mean	SE	CV(%)	Mean	SE	CV(%)	Total	SE	CV(%)	Total	SE	CV(%)
4 Jun - 1 Jul	1.742	0.387	22	1.071	0.225	21	2,774	450	16	1,713	264	15
2 Jul - 29 Jul	1.217	0.150	12	0.570	0.098	17	1,670	238	14	803	128	16
30 Jul - 5 Sep	1.013	0.428	42	0.549	0.380	69	1,481	321	22	814	209	26
4 Jun - 5 Sep	1.343	0.346	26	0.751	0.262	35	5,925	602	10	3,330	360	11

Table 33. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Delta Clearwater River, Tanana River drainage, Alaska, 1988.

Number of Fish	Catch						Harvest					
	n[1]	%	Cumm %	n[2]	%	Cumm %	n[1]	%	Cumm %	n[2]	%	Cumm %
0	18	10	10	0	0	0	38	21	21	0	0	0
1	20	11	21	29	5	5	29	16	38	29	8	8
2	37	21	42	108	18	23	54	30	68	108	31	39
3	24	13	56	78	13	36	26	15	83	78	22	62
4	28	16	71	84	14	50	21	12	94	84	24	86
5	19	11	82	50	8	59	10	6	100	50	14	100
6	14	8	90	84	14	73						
7	8	4	94	56	9	82						
8	3	2	96	24	4	86						
9	1	1	97	9	2	88						
10	4	2	99	40	7	95						
15	1	1	99	15	3	97						
17	1	1	100	17	3	100						
Total	178			594			178			349		

[1] Number of anglers interviewed (complete-trip only) that caught or harvested a certain number of Arctic grayling.

[2] Number of Arctic grayling caught or harvested by each group of anglers interviewed.

Table 34. Estimates of the contributions of each age class, mean fork length (mm) at age, and Relative Stock Density (RSD) of Arctic grayling in the harvest sample from the Delta Clearwater River, Tanana River drainage, Alaska, 1988.

	Age Composition			Fork Length[1]		Relative Stock Density (RSD)				
Age	n	%	SE (%)	Mean	SE	Category	Range[2]	n	%	SE(%)
2	3	1	1	276	9	Stock	150-269	5	1	1
3	14	3	1	277	2	Quality	270-339	281	62	2
4	33	8	1	293	2	Preferred	340-449	165	37	2
5	166	39	2	304	1	Memorable	450-559	0	0	--
6	72	17	2	328	3	Trophy	750-up	0	0	--
7	63	15	2	353	3					
8	41	10	1	368	3	Total		451		
9	19	4	1	382	4					
10	11	3	1	388	7					
11	5	1	1	409	12					
Total	427			326	7					

[1] Fork length is in millimeters (mm).
[2] Range is the fork length range of the RSD category in mm.

Table 35. Demographic profile of anglers interviewed at the Delta Clearwater River, Tanana River drainage, Alaska, 1988.

Angler Characteristic	n[1]	%	SE (%)	Angler Characteristic	n[1]	%	SE(%)
Total Number of Interviews[2]	253	--	--	Local[3]	71	35	3
				Non-local	131	65	3
Male	200	79	3	Tourist	31	12	2
Female	53	21	3	Other	222	88	2
Adult	210	83	2	Gear Type:			
Youth	43	17	2	Spinners	106	42	3
				Jigs	25	10	2
Resident	202	80	3	Flies	122	48	3
Non-Resident	41	16	2				
Military	10	4	1				

[1] Number of anglers in the categories will not always equal the total number of interviews because angler demographics were not marked down for all the anglers interviewed.

[2] Includes both complete- and incomplete-trip angler interviews combined.

[3] Local and non-local category includes Alaska residents only. Local category are anglers from the Delta Junction area.

Table 36. Opinions of anglers interviewed at the Delta Clearwater River, Tanana River drainage, Alaska, 1988.

Question	Opinion	n	%[1]	SE(%)
1. How would you rate the quality of Arctic grayling fishing at the Delta Clearwater River this year?	Excellent (1)	92	36	3
	Good (2)	95	38	3
	Fair (3)	49	19	2
	Poor (4)	17	7	2
	Total	253		
	Mean Rating = 1.98			
2. What is your opinion of a 12 inch minimum length limit for Arctic grayling in the Delta Clearwater River?	Approve	90	89	3
	Disapprove	11	11	3
	No Opinion	24	--	--
	Total	125		
3. What is your opinion of restricting the use of bait in the Delta Clearwater River (Only artificial flies and lures may be used?)	Approve	96	93	3
	Disapprove	7	7	3
	No Opinion	22	--	--
	Total	125		
4. What is your opinion of catch and release fishing only for Arctic grayling in the Delta Clearwater River until the first Saturday in June?	Approve	82	84	4
	Disapprove	15	16	4
	No Opinion	28	--	--
	Total	125		
5. What set of regulations for Arctic grayling fishing would you approve of in the Delta Clearwater River? (1) A two fish daily bag limit with no season closure and no size restrictions? (2) The present regulations (i.e. 5 fish daily bag limit, spring closure, and 12 inch minimum length limit)?	Approve # 1	4	4	2
	Approve # 2	83	90	3
	Neither	6	6	2
	No Opinion	30	--	--
	Total	123		

[1] Percentages are calculated for anglers with opinions only and do not take into account anglers in the no-opinion category.

the anglers interviewed approved of the current management regulations, with 90% approving of a 12 inch minimum length limit for Arctic grayling, 96% approving of a no-bait restriction at the Delta Clearwater River, and 84% approving of catch-and-release fishing only until the first Saturday in June. The anglers were also asked to choose which set of management regulations they would approve if given the following two choices:

1) a two fish daily bag limit with no season closure and no size restrictions; or

2) the present regulations (i.e. 5 fish daily bag limit, spring closure, and a 12 inch minimum length limit.

Ninety percent of the anglers interviewed approved of the present regulations, with 4% approving of option 1 and 6% wanting neither of these two options.

CHAPTER 5 - PILEDRIVER SLOUGH RAINBOW TROUT AND ARCTIC GRAYLING FISHERY

Introduction

Piledriver Slough supports a popular fishery for rainbow trout and Arctic grayling. Piledriver Slough is a slough of the Tanana River originating about 48 km east of Fairbanks near Eielsen Air Force Base (Figure 7). Dike construction from the Moose Creek Flood Control Project blocked the mouth of the Slough in the late 1970's. With the silty waters of the Tanana River blocked, clear spring water began to flow. Because of this, Arctic grayling began using Piledriver Slough and an early season fishery developed.

During the summer of 1987, the Division of Sport Fish, Alaska Department of Fish and Game, stocked rainbow trout in Piledriver Slough. This was the first stocking of rainbow trout into an open system (not landlocked) in the interior of Alaska. Catchable, sub-catchable, and fingerling size rainbow trout were stocked in both 1987 and 1988.

Because of close proximity of Piledriver Slough to the Fairbanks-North Pole area and the stocking of rainbow trout in 1987, there was concern for the potential overharvest of spawning size Arctic grayling in Piledriver Slough. For these reasons, management regulations were initiated for Piledriver Slough that included:

1) a 12 inch minimum length limit for Arctic grayling; and

2) a no-bait restriction (only artificial flies and lures can be used).

In 1986, the year prior to the stocking of rainbow trout and the new regulations were put into effect, no estimate was available for the amount of angler-effort and harvest of Arctic grayling at Piledriver Slough. However, Mills (1986) estimated that 3,500 angler-days were expended on Piledriver Slough in 1985 to harvest 2,000 Arctic grayling. Angler-effort has dramatically increased from 1985 to 1987. Anglers, in 1987, spent an estimated 13,257 angler-days fishing to harvest 4,907 Arctic grayling and 4,346 rainbow trout (Mills 1988).

An on-site creel census has also been conducted at Piledriver Slough since 1985. The mean fork length of harvested Arctic grayling was 250 mm in 1985. Only 4% of the Arctic grayling were of spawning size (> 270 mm) (Holmes et al. 1986). In 1986, the mean fork length of Arctic grayling was 243 mm (Clark and Ridder 1987). However, 15% of the Arctic grayling were of spawning size (> 270 mm). In 1987, the mean fork length of Arctic grayling was 248 mm and the number of spawning size fish increased to approximately 30% (Baker 1988). The creel census was continued in 1988.

The long term goals of the Piledriver Slough creel census were to develop a database of CPUE, HPUE, and biological data for Arctic grayling and rainbow trout to assess management regulations and determine optimal stocking policies for rainbow trout in streams. The specific objectives of the Piledriver Slough creel census were to:

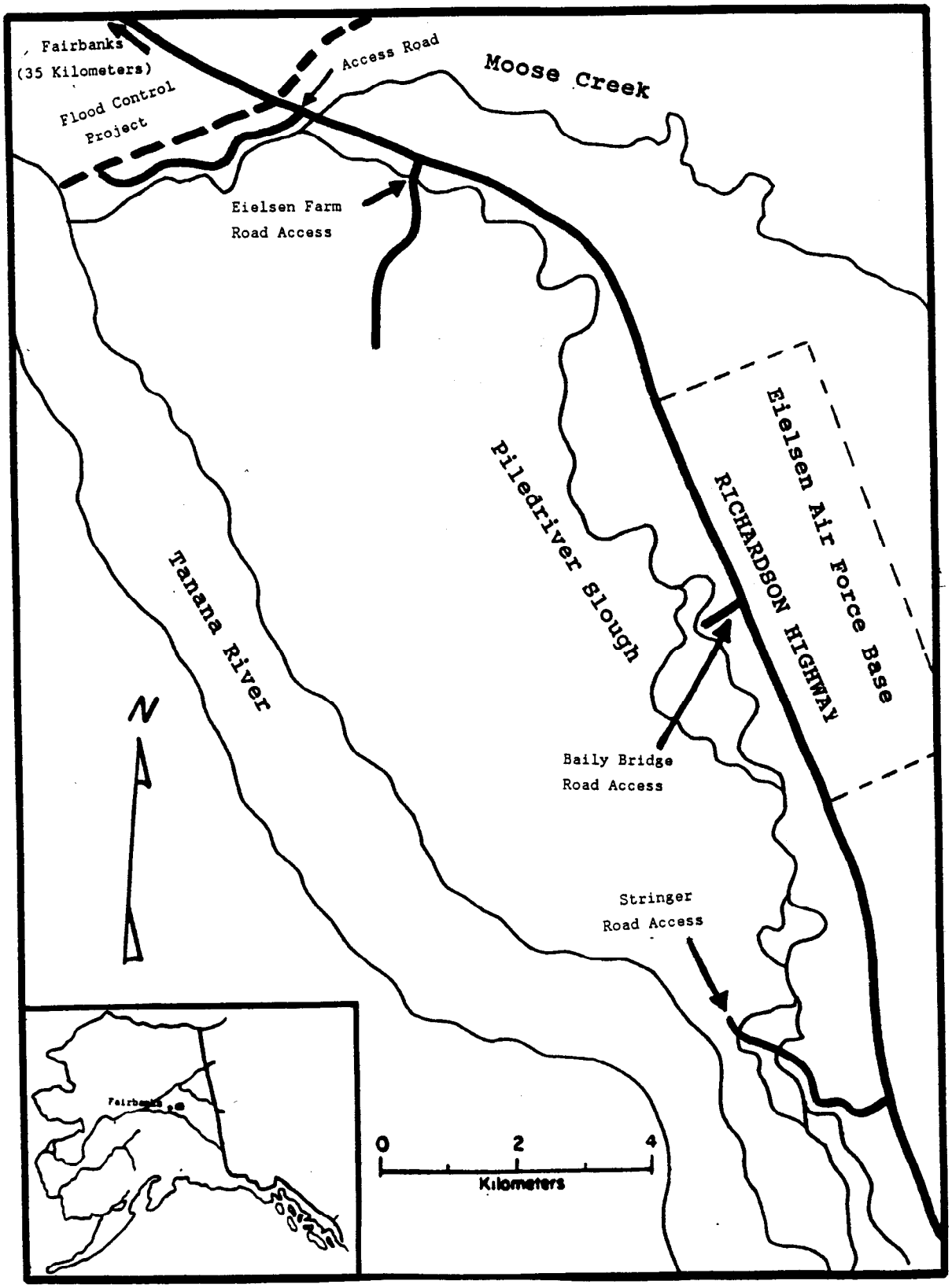

Figure 7. Map of Piledriver Slough, Tanana River drainage, Alaska.

1) estimate CPUE and HPUE for Arctic grayling and rainbow trout at Piledriver Slough;

2) estimate percent age composition, Relative Stock Density (RSD), mean fork length-at-age for each age class of Arctic grayling and rainbow trout in the harvest sample from Piledriver Slough;

3) estimate the percent composition of angler demographics for Piledriver Slough that include: a) male/female, b) adult/youth, c) resident/non-resident/military, d) local/non-local, e) tourist/other, and f) terminal fishing gear (spinner/bait/flies/jigs/trolling/spear/bow and arrow);

4) estimate the percent response (opinions) to questions asked anglers at Piledriver Slough; and,

5) estimate the mean rating of the fishery.

Methods

Piledriver Slough is located approximately 42 km east of Fairbanks just off the Richardson Highway near Eielsen Air Force Base (Figure 7). Access is provided at three road crossings and two roadside parking areas. Almost all the fishing was from shore. This creel census was a roving CPUE survey. The creel census was conducted from 16 May through 9 September 1988.

Angler-effort was concentrated in the evenings during the weekdays and on weekends. The fishing day was defined to occur from 0800 to 2200 hours. Three sampling strata were used in this fishery: (1) weekdays 0800 to 1600 hours; (2) weekdays 1600 to 2200 hours; and (3) weekends and holidays 0800 to 2200 hours. Sampling effort was proportionally allocated based upon the amount time in each stratum. Based upon the amount of creel census time available and variances of 1987 CPUE and HPUE estimates (Baker 1988), each strata was sampled 12.5% of time. Therefore sampling effort was allocated 38%, 29%, and 33% to strata 1, 2, and 3, respectively.

A total of thirty samples per month were collected at randomly selected times distributed among strata as described above. Sample periods were two hours. At the beginning of a two sample sampling period, the creel clerk drove the Richardson Highway eastward and interviewed all anglers that could be accessed along Piledriver Slough. Angler interviews were conducted in reverse order on the way back to Fairbanks. Anglers previously interviewed were not re-interviewed. The majority of interviews were from anglers who had not yet completed their fishing trip.

Results and Discussion

The Piledriver Slough creel census began on 16 May and was conducted through 9 September 1988. During the creel census, 347 anglers were interviewed, of which 292 were incomplete-trip interviews and 55 complete-trip interviews (Table 37). Estimated CPUE and HPUE of Arctic grayling was 1.325 and 0.025 fish-per-hour, respectively. Arctic grayling CPUE peaked in May at 3.041

Table 37. Number of angler interviews, and estimates of CPUE (catch-per-hour), and HPUE (harvest-per-hour) of Arctic grayling and rainbow trout at Piledriver Slough, Tanana River drainage, Alaska, 1988.

Strata	Angler Interviews			CPUE			HPUE		
	Complete	Incomplete	Total	Mean	SE	CV(%)	Mean	SE	CV(%)
Arctic Grayling									
16 May - 3 Jun	4	21	25	3.041	1.044	34	0.000	0.000	0
4 Jun - 1 Jul	27	127	154	0.977	0.555	57	0.008	0.014	175
2 Jul - 29 Jul	9	69	78	1.895	1.710	90	0.023	0.030	130
30 Jul - 9 Sep	15	75	90	0.580	0.303	52	0.047	0.037	79
16 May - 9 Sep	55	288	347	1.325	0.985	74	0.025	0.028	112
Rainbow Trout									
16 May - 3 Jun	4	21	25	0.000	0.000	0	0.000	0.000	0
4 Jun - 1 Jul	27	127	154	2.028	0.742	37	0.319	0.170	53
2 Jul - 29 Jul	9	69	78	0.426	0.373	88	0.060	0.103	171
30 Jul - 9 Sep	15	75	90	3.125	0.691	22	0.836	0.480	57
16 May - 9 Sep	55	292	347	1.917	0.665	35	0.386	0.281	73

fish-per-hour with Arctic grayling HPUE peaking in August at 0.047 fish-per-hour. Rainbow trout CPUE was 1.917 fish-per-hour, HPUE was 0.386 fish-per-hour. Both rainbow trout CPUE and HPUE peaked in August at 3.125 and 0.836 fish-per-hour, respectively.

Sixty percent of the anglers interviewed caught no Arctic grayling and 89% harvested no Arctic grayling (Table 38). Anglers who caught five or fewer Arctic grayling accounted for 48% of the catch while accounting for 100% of the harvest. Anglers interviewed caught from 0 to 20 rainbow trout with 60% catching no rainbow trout and 84% harvesting zero rainbow trout (Table 39). Anglers interviewed who caught 10 or fewer rainbow trout accounted for 67% of the catch and 100% of the harvest.

Biological data were collected from 6 Arctic grayling and 45 rainbow trout in the harvest sample at Piledriver Slough. Fifty percent of the Arctic grayling in the harvest sample were stock length and the other 50% percent were of quality length (Table 40). The majority of the rainbow trout in the harvest sample (78%) were in the stock length category with 22% in the quality length category. No Arctic grayling or rainbow trout in the harvest sample were in the preferred, memorable, or trophy length categories. Mean fork length-at-age was not estimated.

The majority of the anglers interviewed at Piledriver Slough were male (87%), adult (79%), and residents of the State of Alaska (51%) (Table 41). The fishery was also popular for military personnel (43%). Six percent of the anglers were non-residents. Of the anglers interviewed who were residents, 100% were from the Fairbanks-North Pole area. Only 2% of all the anglers were tourists. The anglers were almost evenly split on their choice of terminal fishing gear with 53% using flies and 42% using spinners. Even though Piledriver Slough was closed to the use of bait, 3% of the anglers interviewed used bait.

Anglers that were interviewed gave the Piledriver Slough a mean rating of 2.37, which is a rating of good to fair (Table 42). When asked opinions about management regulations, the anglers were highly in favor of stocking rainbow trout (97%), approved of a 12 inch minimum length limit for Arctic grayling (79%), and approved of a no-bait restriction at Piledriver Slough (75%).

Table 38. Distribution of Arctic grayling catch and harvest among anglers interviewed at Piledriver Slough, Tanana River drainage, Alaska, 1988.

Number of Fish	Catch						Harvest					
	n[1]	%	Cumm %	n[2]	%	Cumm %	n[1]	%	Cumm %	n[2]	%	Cumm %
0	33	60	60	0	0	0	49	89	89	0	0	0
1	11	20	80	11	17	17	4	7	96	4	40	40
2	3	5	85	6	10	27	1	2	98	2	20	60
3	3	5	91	9	14	41	0	0	98	0	0	60
4	1	2	93	4	6	48	1	2	100	4	40	100
5	0	0	93	0	0	48	0	0	100	0	0	100
6	0	0	93	0	0	48						
7	2	4	96	14	22	70						
8	1	2	98	8	13	83						
9	0	0	98	0	0	83						
10	0	0	98	0	0	83						
11	1	2	100	11	17	100						
Total	55			63			55			10		

[1] Number of anglers interviewed (complete-trip only) that caught or harvested a certain number of Arctic grayling.

[2] Number of Arctic grayling caught or harvested by each group of anglers interviewed.

Table 39. Distribution of rainbow trout catch and harvest among anglers interviewed at Piledriver Slough, Tanana River drainage, Alaska, 1988.

Number of Fish	Catch						Harvest					
	n[1]	%	Cumm %	n[2]	%	Cumm %	n[1]	%	Cumm %	n[2]	%	Cumm %
0	33	60	60	0	0	0	46	84	84	0	0	0
1	7	13	73	7	7	7	3	5	89	3	9	9
2	5	9	82	10	10	16	2	4	93	4	12	21
3	0	0	82	0	0	16	0	0	93	0	0	21
4	1	2	84	4	4	20	2	4	96	8	24	44
5	1	2	85	5	5	25	0	0	96	0	0	44
6	3	5	91	18	17	42	0	0	96	0	0	44
7	1	2	93	7	7	49	0	0	96	0	0	44
8	0	0	93	0	0	49	0	0	96	0	0	44
9	1	2	95	9	9	58	1	2	98	9	26	71
10	1	2	96	10	10	67	1	2	100	10	29	100
11	0	0	96	0	0	67						
12	0	0	96	0	0	67						
13	0	0	96	0	0	67						
14	1	2	98	14	13	81						
15	0	0	98	0	0	81						
16	0	0	98	0	0	81						
17	0	0	98	0	0	81						
18	0	0	98	0	0	81						
19	0	0	98	0	0	81						
20	1	2	100	20	19	100						
Total	55			104			55			34		

[1] Number of anglers interviewed (complete-trip only) that caught or harvested a certain number of rainbow trout.

[2] Number of rainbow trout caught or harvested by each group of anglers interviewed.

Table 40. Relative Stock Density (RSD) of Arctic grayling and rainbow trout in the harvest sample at Piledriver Slough, Tanana River drainage, Alaska, 1988.

Category	Range[1]	n	%	SE (%)
Arctic Grayling				
Stock	150-269	3	50	22.0
Quality	270-339	3	50	22.0
Preferred	340-449	0	0	---
Memorable	450-559	0	0	---
Trophy	560-above	0	0	---
Total		6		
Rainbow Trout				
Stock	180-224	35	78	6.0
Quality	225-299	10	22	6.0
Preferred	300-374	0	0	---
Memorable	375-449	0	0	---
Trophy	450-above	0	0	---
Total		45		

[1] Range is the fork length range of the RSD category in mm.

Table 41. Demographic profile of anglers interviewed at Piledriver Slough, Tanana River drainage, Alaska, 1988.

Angler Characteristic	n[1]	%	SE	Angler Characteristic	n[1]	%	SE(%)
Total Number of Interviews[2]	347	--	--	Local[3]	175	100	0
				Non-local	0	0	0
Male	302	87	2	Tourist	6	2	1
Female	44	13	2	Other	340	98	1
Adult	273	79	2	Gear Type:			
Youth	73	21	2	Spinners	146	42	3
				Bait	11	3	1
Resident	175	51	3	Jigs	6	2	1
Non-Resident	21	6	1	Flies	183	53	3
Military	150	43	3				

[1] Number of anglers in the categories will not always equal the total number of interviews because angler demographics were not marked down for all the anglers interviewed.

[2] Includes both complete- and incomplete-trip angler interviews combined.

[3] Local and non-local includes Alaska residents only. Local category are anglers from the Fairbanks-North Pole area.

Table 42. Opinions of anglers interviewed at Piledriver Slough, Tanana River drainage, Alaska, 1988.

Question	Opinion	n	%[1]	SE(%)
1. How would you rate the quality of fishing at Piledriver Slough this year?	Excellent (1)	34	16	3
	Good (2)	87	42	3
	Fair (3)	63	30	3
	Poor (4)	24	12	2
	Total	208		
	Mean Rating = 2.37			
2. What is your opinion of stocking rainbow trout in Piledriver Slough?	Approve	235	97	1
	Disapprove	8	3	1
	No Opinion	7	--	--
	Total	250		
3. What is your opinion of a 12 inch minimum length limit for Arctic grayling in Piledriver Sloughiver?	Approve	187	79	3
	Disapprove	50	21	3
	No Opinion	12	--	--
	Total	249		
4. What is your opinion of restricting the use of bait in Piledriver Slough (only artificial flies and lures may be used)?	Approve	174	75	3
	Disapprove	58	25	3
	No Opinion	18	--	--
	Total	250		

[1] Percentages are calculated for anglers with opinions only and do not take into account anglers in the no-opinion category.

CHAPTER 6 - SALCHA RIVER CHINOOK AND CHUM SALMON FISHERY

Introduction

The Salcha River is located about 67 km east of Fairbanks on the Richardson Highway (Figure 8). The Salcha River supports a popular chinook and chum salmon recreational fishery that occurs during the month of July. The chinook salmon run in the Salcha River is the largest documented run in the middle Yukon River drainage (Barton 1985). From 1977 to 1986, sport harvest of chinook salmon in the Salcha River has ranged from 27 to 809, annually averaging 278 (Mills 1979-1988). Chum salmon also migrate up the Salcha River during the later part of July. The chum salmon are not as important to recreational anglers, but still provide some angler opportunities. Up to 1987, fishing was allowed in the lower 23 km of the river. However, chinook salmon were found to be spawning in part of this section. Because of this, fishing was limited in 1988 to the lower 8 km of the river.

There has been a creel census conducted on the Salcha river since 1985. This creel census was continued in 1988. The goal of the creel census was to monitor the effects of sport fishing on this important fishery. The specific objectives of this creel census were to:

1) estimate angler-effort, CPUE, HPUE, catch and harvest expended at the Salcha River chinook and chum salmon fishery;

2) estimate the percent age composition, Relative Stock Density and mean length-at-age for chinook and chum salmon;

3) estimate the percent composition of angler demographics for the Salcha River that include: a) male/female, b) adult/youth, c) resident/non-resident/military, d) local/ non-local, e) tourist/other, and f) terminal fishing gear (spinner/bait/ flies/jigs/trolling/spear/bow and arrow);

4) estimate the percent response (opinions) to questions asked anglers at the Salcha River; and,

5) estimate the mean rating of the fishery.

Methods

Two major access areas are available to Salcha River chinook and chum salmon anglers (Figure 8). All anglers using boats launch at the State boat launch facility where the Richardson Highway crosses the Salcha River. Most shore based anglers walk to the river from a parking area at the Richardson Highway pulloff located 1.5 km west of the river at Munson's Slough. About equal amounts of fishing effort are expended by boat and shore anglers.

The creel census was a roving harvest survey conducted during the month of July. The fishery was stratified into weekend and weekday strata. The fishing day was defined to occur from 0600 to 2400 hours. The sample period was three hours in duration. Ten periods were sampled each week.

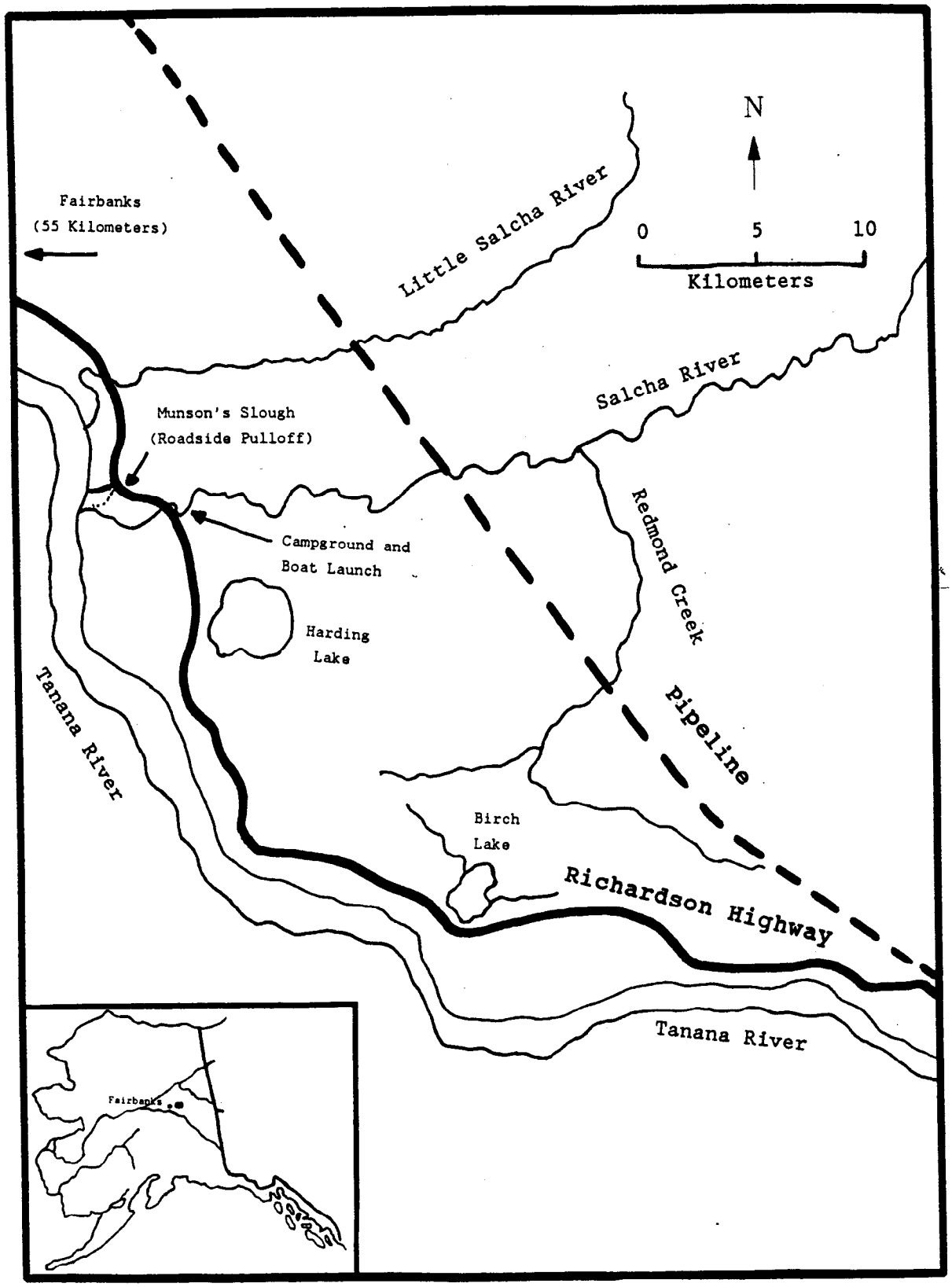

Figure 8. Map of the Salcha River, Tanana River drainage, Alaska.

An angler count was conducted at a randomly selected time each hour of the sample period. The rest of the hour was used to perform angler interviews. A river boat was used to make angler counts between the access point (boat launch facility) and the mouth of the Salcha River. Angler counts took about 10 minutes to conduct. Creel clerk time was then split between the boat launch area and the shore angler's pulloff area. The majority of anglers interviewed had completed their fishing trip.

Results and Discussion

The Salcha River creel census was conducted from 2 July through 24 July 1987. A total of 93 angler counts was made (Table 43). Estimated angler-effort was 4,398 hours. Twenty-nine percent of the total angler-effort was expended from 18 July through 22 July. One-hundred-eighty-seven anglers were interviewed, of which 182 were complete-trip interviews. Estimated CPUE and HPUE for chinook salmon were the same with 0.004 fish-per-hour being caught (Table 44). A total of 19 chinook salmon were caught. All of the chinook salmon were caught from 11 July to 17 July. Estimated CPUE and HPUE for chum salmon was 0.005 and 0.002, respectively. The catch and harvest of chum salmon was 21 and 11 fish, respectively. All of the chum salmon catch and harvest occurred from 18 July through 22 July.

Insufficient numbers of chinook and chum salmon in the harvest sample precluded estimates of age, Relative Stock Density, and mean length.

The majority of anglers interviewed at the Salcha River were male (86%), adult (89%), and residents of the State of Alaska (60%) (Table 45). Thirty-one percent of the anglers were military personnel and 9% were non-residents. Of the anglers who were residents, 100% were from the Fairbanks-North Pole area. Only 1% of all the anglers interviewed were tourists. Ninety-seven percent of the anglers used spinners as their terminal gear type.

The anglers gave the fishery a mean rating of 3.81, or a rating poor to fair (Table 46). Eighty-three percent of these anglers knew the bag limit for salmon and 100% said public boat access at the Salcha River was adequate. The majority of anglers approved of reduced seasons and fishing closures as a means of managing the fishery (97%). Also, 89% approved of stocking chinook salmon in the Salcha River.

Table 43. Number of angler interviews, angler counts, and estimates of angler-effort (hours) at the Salcha River, Tanana River drainage, Alaska, 1988.

Stratum	Angler Interviews			Angler-Effort			
	Complete	Incomplete	Total	Counts	Hours	SE	CV(%)
2 Jul - 4 Jul	14	3	17	9	448	51	11
5 Jul - 8 Jul	19	2	21	17	514	82	16
9 Jul - 10 Jul	23	0	23	7	264	81	31
11 Jul - 15 Jul	23	0	23	18	770	66	9
16 Jul - 17 Jul	31	0	31	12	697	75	11
18 Jul - 22 Jul	35	0	35	15	1,274	167	13
23 Jul - 24 Jul	37	0	37	15	431	34	8
2 Jul - 24 Jul	182	5	187	93	4,398	234	5

Table 44. Estimates of CPUE (catch-per-hour), HPUE (harvest-per-hour), catch, and harvest of chinook and chum salmon at the Salcha River, Tanana River drainage, Alaska, 1988.

Stratum	CPUE			HPUE			Catch			Harvest		
	Mean	SE	CV(%)	Mean	SE	CV(%)	Total	SE	CV(%)	Total	SE	CV(%)
Chinook Salmon												
2 Jul - 4 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
5 Jul - 8 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
9 Jul - 10 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
11 Jul - 15 Jul	0.013	0.013	95	0.013	0.013	95	10	10	97	10	10	97
16 Jul - 17 Jul	0.013	0.012	96	0.013	0.012	96	9	8	92	9	8	92
18 Jul - 22 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
23 Jul - 24 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
2 Jul - 24 Jul	0.004	0.007	165	0.004	0.007	165	19	13	67	19	13	67
Chum Salmon												
2 Jul - 4 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
5 Jul - 8 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
9 Jul - 10 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
11 Jul - 15 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
16 Jul - 17 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
18 Jul - 22 Jul	0.017	0.016	95	0.008	0.008	96	21	21	96	11	10	96
23 Jul - 24 Jul	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
2 Jul - 24 Jul	0.005	0.009	178	0.002	0.004	178	21	21	96	11	10	96

Table 45. Demographic profile of anglers interviewed at the Salcha River, Tanana River drainage, Alaska, 1988.

Angler Characteristic	n[1]	%	SE (%)	Angler Characteristic	n[1]	%	SE (%)
Total Number of Interviews[2]	187	--	--	Local[3]	111	100	0
				Non-local	0	0	0
Male	161	86	3	Tourist	1	1	1
Female	26	14	3	Other	186	99	1
Adult	166	89	2	Gear Type:			
Youth	21	11	2	Spinners	179	97	1
				Jigs	4	2	1
Resident	111	60	4	Flies	1	1	1
Non-Resident	17	9	2				
Military	57	31	3				

[1] Number of anglers in the categories will not always equal the total number of interviews because angler demographics were not marked down for all the anglers interviewed.

[2] Includes both complete- and incomplete-trip angler interviews combined.

[3] Local and non-local includes Alaska residents only. Local category are anglers from the Fairbanks-North Pole area.

Table 46. Opinions of anglers interviewed at the Salcha River, Tanana River drainage, Alaska, 1988.

Question	Opinion	n	%[1]	SE (%)
1. How would you rate the quality of fishing for chinook salmon in the Salcha River this year?	Excellent (1)	0	0	0
	Good (2)	4	3	2
	Fair (3)	15	13	3
	Poor (4)	99	84	3
	Total	118		
	Mean Rating = 3.81			
2. What is the bag limit for chinook salmon in the Salcha River?	One	85	83	4
	Three	2	2	1
	Other	16	15	4
	Total	103		
3. Is public boat access adequate for the Salcha River?	Yes	76	100	0
	No	0	0	0
	No-Opinion	27	---	--
	Total	103		
4. What is your opinion of using reduced seasons and emergency closures to manage chinook salmon in the Salcha River?	Approve	88	97	2
	Disapprove	3	3	2
	No-Opinion	6	---	--
	Total	97		
5. What is your opinion of stocking chinook salmon in the Salcha River?	Approve	73	89	4
	Disapprove	9	11	4
	No-Opinion	9	---	--
	Total	91		

[1] Percentages are calculated for anglers with opinions only and do not take into account anglers in the no-opinion category.

CHAPTER 7 - TANGLE SYSTEM ARCTIC GRAYLING FISHERY

Introduction

The Tangle Lakes and River system, hereafter called the Tangle System, is located approximately 30 km west of Paxson on the Denali Highway (Figure 9). The Tangle System is a combination of lakes interconnected by short stretches of river. The system includes five named lakes and 117 km of tributary streams. The Denali Highway bisects the system between Upper Tangle and Round Tangle Lakes. There are Bureau of Land Management (BLM) campgrounds adjacent to the river at both lakes nest to the highway. Round Tangle Lake is the start of a popular 67 km float trip on the Delta River. A large portion of the Tangle System and Delta River are designated as a National Wild and Scenic River.

The Tangle Lakes system has supported popular fisheries for Arctic grayling, lake trout, and burbot since the construction of the Denali Highway in the 1950's. The heaviest angling pressure occurred on Upper and Round Tangle Lakes and the interconnecting Tangle River. Since 1978, an average of 6,329 angler-days have been expended annually to harvest 5,962 Arctic grayling, 988 lake trout, 189 whitefish, and 109 burbot (Mills 1979-1988). Serious concern for the burbot and lake trout stocks prompted ADFG to close the Tangle System to harvesting of these species in 1987. In 1988, these the regulations were again changed so that the daily bag and possession limit for lake trout was one fish exceeding 457 mm (18 inches) in length. The daily bag and possession limit for burbot was changed to two fish with no size limit.

A creel census was conducted at the Tangle System in 1988. This creel census was conducted in conjunction with a stock assessment program for Arctic grayling (Baker 1989). The specific objectives of the creel census were to:

1) estimate angler effort, catch, harvest, CPUE, and HPUE for Arctic grayling in the Tangle River;

2) estimate CPUE and HPUE for Arctic grayling, lake trout, and burbot in the Tangle Lakes;

3) estimate percent age composition, Relative Stock Density (RSD), and mean fork length-at-age for each age class of Arctic grayling in the harvest sample from the Tangle System;

4) estimate the percent composition of angler demographics for the Tangle System that include: a) male/female, b) adult/youth, c) resident/non-resident/military, d) local/non-local, e) tourist/other, and f) terminal fishing gear (spinner/bait/flies/jigs/trolling/spear/bow and arrow);

5) estimate the percent response (opinions) to questions asked anglers at the Tangle System; and,

6) estimate the mean rating of the fishery.

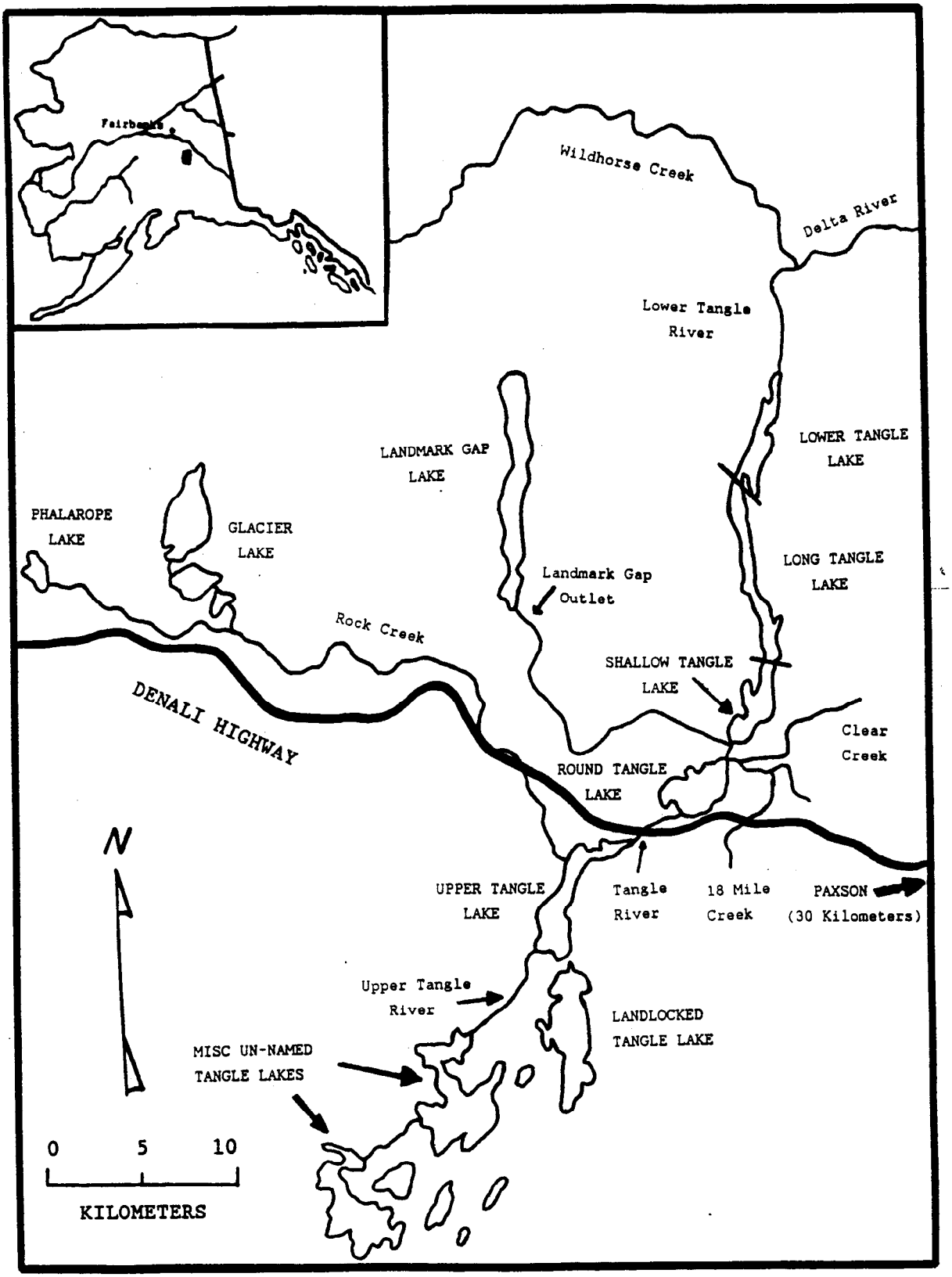

Figure 9. Map of the Tangle Lakes and River system, Tanana River drainage, Alaska.

Methods

There is access to the two main lakes (Upper Tangle and Round Tangle Lakes) at a BLM campground at each lake. Both shore and boat anglers use this area. Anglers also commonly fish the short stretch of river that connects the two lakes (Tangle River). The Tangle Lakes creel census was a roving CPUE survey designed to estimate CPUE and HPUE at the Tangle System.

The creel census was conducted from 4 June through 5 September 1988. The fishing day was defined from 0800 to 2400 hours. The sample design used two strata per month: (1) weekdays 0800 to 2400 hours and (2) weekends and holidays 0800 to 2400 hours. Sampling effort was allocated to the two strata based upon the amount of time in each strata. From this, 68% of the sampling effort was conducted in strata 1 and 32% in strata 2. The sample period was four hours. Ten sample periods were randomly selected each month to be sampled.

The Tangle Lakes system was split into three areas for this creel census: (1) Tangle Lakes upstream from the Tangle River; (2) the Tangle River; and (3) Tangle Lake downstream from the Tangle River. All areas were surveyed during the four hour sample period. The order of creel census in these areas was randomly chosen before sampling was conducted. When one of the lake areas was sampled, the creel clerk would start the sample period at the access point for the upper or lower lakes and would interview anglers as they completed fishing. The clerk would then interview anglers at the Tangle River. The clerk would then move to the other lake area and interview anglers. The clerk would spend approximately one hour in each area, with the final hour spent going through the campground areas and finding anglers that were missed during the first part of the creel census.

Results and Discussion

Census crews were unable to obtain accurate counts of anglers because of the vast area of the Tangle River, and duties with the stock assessment project which was concurrent with the census project. Therefore, estimates of angler effort, catch, harvest, CPUE, and HPUE were not made for the Tangle River. Estimates of CPUE and HPUE for Arctic grayling were not generated for the upper and lower Tangle Lakes; rather, CPUE and HPUE estimates for Arctic grayling in the entire Tangle System were calculated. No estimates of CPUE and HPUE for lake trout and burbot were calculated. A total of 239 anglers were interviewed at the Tangle System. Two hundred fifteen were complete-trip interviews and 24 were incomplete-trip interviews. Estimated CPUE and HPUE for Arctic grayling was 1.073 and 0.416 fish-per-hour, respectively (Table 47). CPUE and HPUE stayed fairly consistent throughout the entire summer.

Insufficient numbers of Arctic grayling (< 30) were sampled in the harvest for estimates of percent age composition, Relative Stock Density, and mean fork length-at-age. Harvest sampling did not appreciably increase the number of tags or fin clips sought in the Arctic grayling stock assessment program.

Table 47. Number of angler interviews, and estimates of CPUE (catch-per-hour), and HPUE (harvest-per-hour) of Arctic grayling at the Tangle Lakes and River system, Tanana River drainage, Alaska, 1988.

Strata	Angler Interviews			CPUE			HPUE		
	Complete	Incomplete	Total	Mean	SE	CV(%)	Mean	SE	CV(%)
4 Jun - 1 Jul									
Weekdays	0	0	0	0.000	---	--	0.000	---	--
Weekends	15	3	18	0.832	0.261	31	0.433	0.152	35
2 Jul - 29 Jul									
Weekdays	5	0	5	0.800	0.123	15	0.400	0.061	15
Weekends	152	9	161	1.301	0.158	12	0.371	0.050	13
30 Jul - 5 Sep									
Weekdays	18	0	18	1.020	0.561	55	0.543	0.314	58
Weekends	25	12	37	1.563	0.365	23	0.218	0.092	42
4 Jun - 5 Sep	215	24	239	1.073	0.144	13	0.416	0.196	47

Of the anglers interviewed at the Tangle System, 37% caught no Arctic grayling while 61% harvested no Arctic grayling (Table 48). Also, anglers who caught eight Arctic grayling or less accounted for 32% of the catch. Anglers who caught five or fewer Arctic grayling accounted for 28% of the total catch while anglers who harvested five or fewer Arctic grayling accounted for 95% of the harvest. Even though the daily bag limit was five Arctic grayling, one angler harvested 10 Arctic grayling.

The majority of the anglers interviewed at the Tangle System were male (87%), adult (78%), and residents of the State of Alaska (83%) (Table 49). Eleven percent of the anglers were non-resident and 6% were military personnel. Of the anglers that were residents, only 1% were from the Paxson area. Of all the anglers interviewed, 2% were tourists. The anglers were split on their favorite terminal gear type with 47% using flies and 42% using spinners.

Anglers interviewed at the Tangle System gave the Arctic grayling fishing a mean rating of 1.89, which is a good to excellent rating (Table 50). Of the anglers interviewed, 39% gave the fishing an excellent rating, 40% a good rating, 11% a fair rating, and 8% a poor rating. These same anglers were asked a series of management related questions. Ninety-seven percent thought public boat access was adequate (97%). Eighty-six percent approved of a minimum length limit for Arctic grayling. Eighty-three percent approved of one fish daily bag limit for lake trout and 81% approved of a 18 inch minimum length limit for lake trout. Finally, 95% of the anglers interviewed were in favor of a two fish daily bag and possession limit for burbot.

Table 48. Distribution of Arctic grayling catch and harvest among anglers interviewed at the Tangle Lakes and River system, Tanana River drainage, Alaska, 1988.

Number of Fish	Catch						Harvest					
	n[1]	%	Cumm %	n[2]	%	Cumm %	n[1]	%	Cumm %	n[2]	%	Cumm %
0	80	37	37	0	0	0	131	61	61	0	0	0
1	27	13	50	27	4	4	26	12	73	26	13	13
2	29	13	63	58	8	11	29	13	87	58	28	41
3	8	4	67	24	3	14	10	5	91	30	14	55
4	13	6	73	52	7	21	7	3	94	28	14	69
5	11	5	78	55	7	28	11	5	100	55	27	95
6	8	4	82	48	6	35	0	0	100	0	0	95
7	10	5	87	70	9	44	0	0	100	0	0	95
8	8	4	90	64	8	52	0	0	100	0	0	95
9	2	1	91	18	2	55	0	0	100	0	0	95
10	2	1	92	20	3	57	1	0	100	10	5	100
11	0	0	92	0	0	57						
12	2	1	93	24	3	61						
13	4	2	95	52	7	67						
18	1	0	95	18	2	70						
20	2	1	96	40	5	75						
21	2	1	97	42	6	81						
22	3	1	99	66	9	89						
25	1	0	99	25	3	93						
27	1	0	100	27	4	96						
30	1	0	100	30	4	100						
Total	215			760			215			207		

[1] Number of anglers interviewed (complete-trip only) that caught or harvested a certain number of Arctic grayling.

[2] Number of Arctic grayling caught or harvested by each group of anglers interviewed.

Table 49. Demographic profile of anglers interviewed at the Tangle Lakes and River system, Tanana River drainage, Alaska, 1988.

Angler Characteristic	n[1]	%	SE (%)	Angler Characteristic	n[1]	%	SE(%)
Total Number of Interviews[2]	239	--	-	Local[3]	1	1	1
				Non-local	199	99	1
Male	198	87	2	Tourist	36	2	1
Female	39	13	2	Other	203	98	1
Adult	184	78	3	Gear Type:			
Youth	53	22	3	Spinners	100	42	3
				Trolling	27	11	2
Resident	200	83	2	Flies	110	47	3
Non-Resident	28	11	2				
Military	14	6	2				

[1] Number of anglers in the categories will not always equal the total number of interviews because angler demographics were not marked down for all the anglers interviewed.

[2] Includes both complete- and incomplete-trip angler interviews combined.

[3] Local and non-local includes Alaska residents only. Local category are anglers from the Paxson Area.

Table 50. Opinions of anglers interviewed at the Tangle Lakes and River system, Tanana River drainage, Alaska, 1988.

Question	Opinion	n	%[1]	SE (%)
1. How would you rate the quality of fishing for Arctic grayling in the Tangle Lakes and River system this year?	Excellent (1)	43	39	5
	Good (2)	44	40	5
	Fair (3)	13	11	3
	Poor (4)	9	8	3
	Total	109		
	Mean Rating = 1.89			
2. Is public boat access adequate at the Tangle Lakes and River system?	Yes	75	97	1
	No	13	3	1
	No Opinion	19	--	--
	Total	107		
3. What is your opinion of a minimum length limit for Arctic grayling in the Tangle Lakes and River system?	Approve	82	86	4
	Disapprove	13	14	4
	No Opinion	10	--	--
	Total	105		
4. What is your opinion of the one fish daily bag and possession for lake trout in the Tangle Lakes and River system?	Approve	62	83	4
	Disapprove	13	17	4
	No Opinion	33	--	--
	Total	108		
5. What is your opinion of a 18 inch minimum length limit for lake trout in the Tangle Lakes and River system?	Approve	56	81	5
	Disapprove	13	19	5
	No Opinion	35	--	--
	Total	104		
6. What is your opinion of the two fish daily bag and possession limit for burbot in the Tangle Lakes and River system?	Approve	38	95	3
	Disapprove	2	5	3
	No Opinion	64	--	--
	Total	104		

[1] Percentages are calculated for anglers with opinions only and do not take into account anglers in the no-opinion category.

CHAPTER 8 - WEST DOCK (PRUDHOE BAY) DOLLY VARDEN CHAR FISHERY

Introduction

Within the Prudhoe Bay industrial area, a sport fishery for Dolly Varden, hereafter referred to as char, has developed at the West Dock causeway (Figures 10 and 11). The focus of the fishery occurs at the west base of the causeway. Some researchers believe the char concentrate in this area due to the presence of the causeway and when ice conditions in early-to-mid July restrict offshore dispersal of char. If char are concentrating in this area, high rates of exploitation could occur. The amount of angler effort and harvest is presently unknown. Historically, sport fishing for char has occurred at West Dock since 1975 when 1,400 m of the facility was completed. In 1975, up to 40 anglers per day were using the new facility (Alt and Furniss 1976). In the early 1980's, when significantly more people were working in the oilfields, there were reports of up to 80 anglers fishing for char at any one time along the causeway. Currently, unconfirmed verbal reports indicate that up to 50 anglers may participate in the fishery at any one time.

Because of the lack of knowledge concerning the char fishery and the possibility of over-exploitation, a creel survey was conducted to monitor this fishery. The creel survey was a cooperative effort between the Sport Fish and Habitat Divisions of the Alaska Department of Fish and Game. The creel survey was designed and funded by the Division of Sport Fish with personnel from the Division of Habitat conducting the creel survey.

The specific objectives of the creel census were to:

1) estimate angler effort, CPUE, HPUE, catch and harvest for Dolly Varden char;

2) estimate the percent age composition, Relative Stock Density and mean fork length-at-age;

3) estimate the percent composition of angler demographics for the West Dock Causeway that include: a) male/female, b) adult/youth, c) resident/non-resident/military, d) local/non-local, e) tourist/other, and f) terminal fishing gear (spinner/bait/flies/jigs/trolling/spear/bow and arrow);

4) estimate the percent response to questions asked anglers at the West Dock causeway; and,

5 estimate the mean rating by anglers of the quality of fishing at the West Dock causeway.

Methods

Access to the West Dock causeway is limited to a single road from the Prudhoe Bay oilfield road system. The majority of fishing occurs at the west base of the causeway, with limited fishing also occurring along the rest of the causeway. Use of particular fishing areas is greatly influenced by the

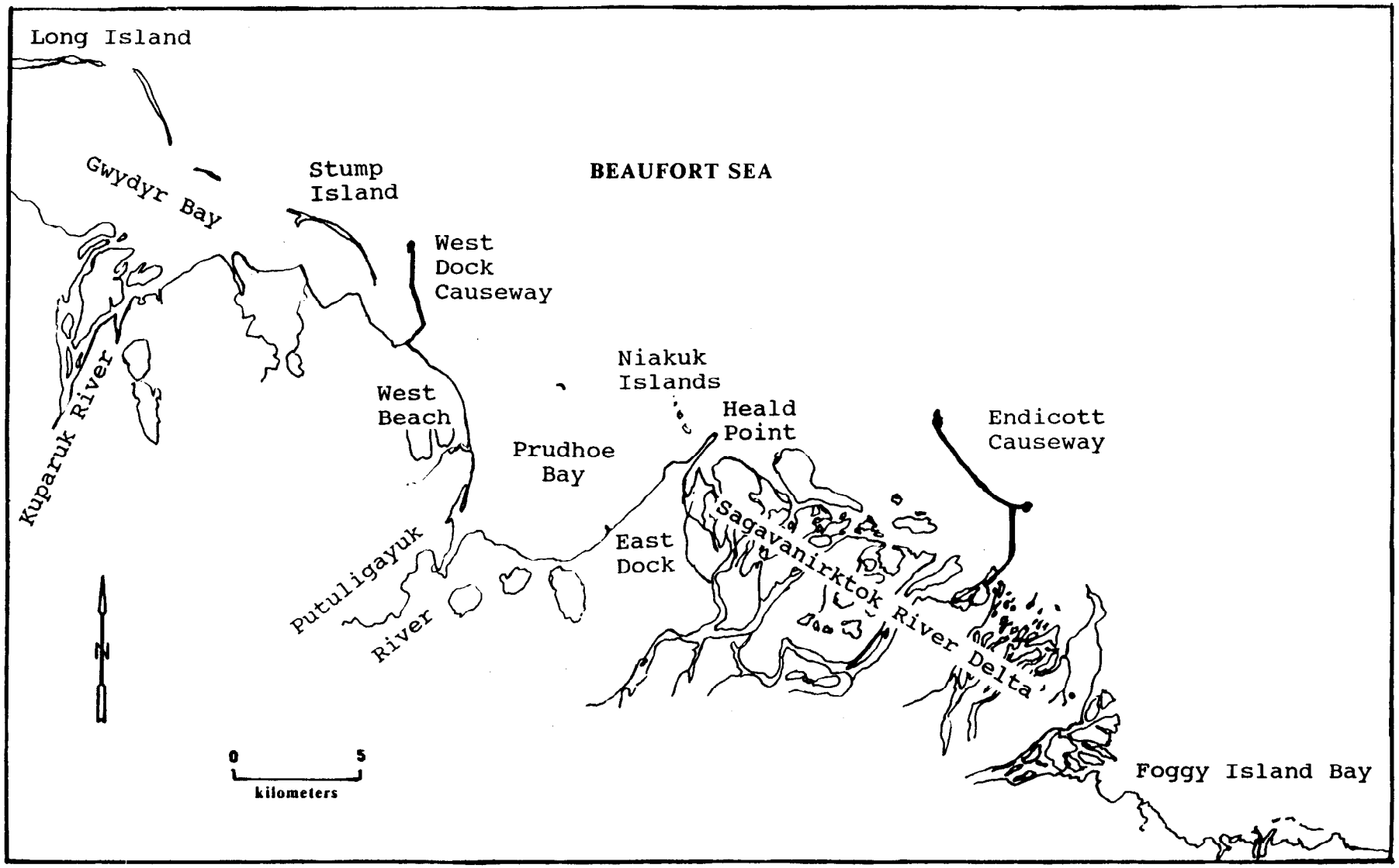

Figure 10. Map depicting the major features of the Prudhoe Bay Region, Alaska.

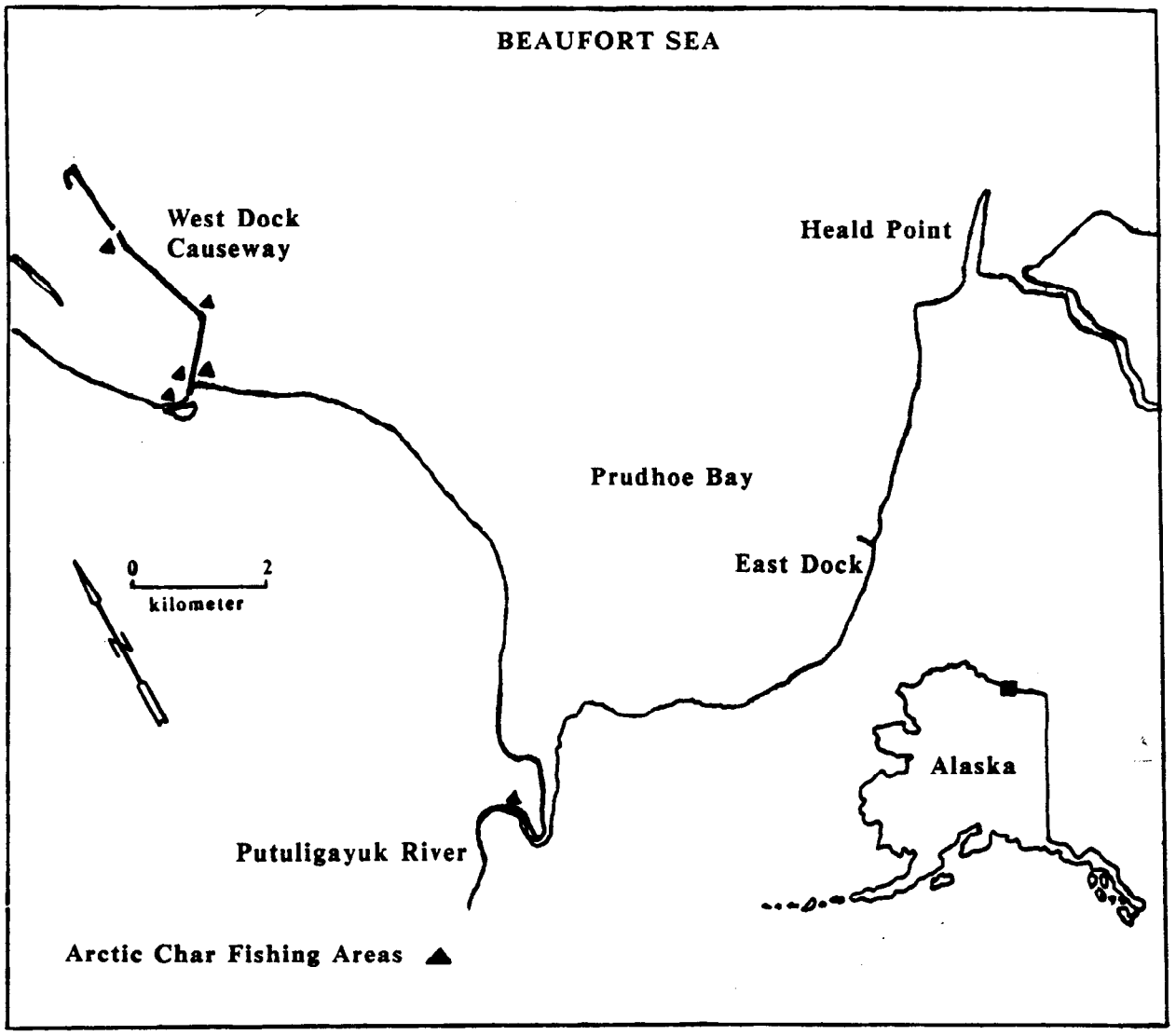

Figure 11. Map of the Prudhoe Bay area depicting char sport fishing areas of anglers surveyed in 1988.

presence of sea ice. The West Dock causeway char fishery was thought to begin 1 July and end the middle of August. Because of logistical reasons, two 10 day sampling periods were deemed sufficient to meet the creel survey objective criteria. The first period was conducted from 8 July through 17 July. The second sampling period was conducted from 26 July through 5 August.

At the beginning of the first sampling period, fishing was defined to occur 24 hours a day, as it was believed that fishing occurred during all hours of the day and that no set work shifts occurred. Also, all days of the week were treated the same because oil workers work seven days per week and were thought to pay little attention to the day of the week. However, during the first sampling period beginning 8 July, it was soon learned that the majority of fishing occurred between 7000 to 1000 hours, and 1900 to 2200 hours. Therefore, the fishing day was defined to occur during these six hours. No differences were seen between fishing effort on weekdays and on weekends. However, it was not certain if effort was the same between morning and evening hours. Therefore, during the first sampling period two strata were defined; one morning strata and one evening strata. During the second sampling period, one strata was used because no differences in effort were found between the morning and evening hours. A total of three strata were defined for the fishery.

Two angler count/interview trips were conducted each day that included conducting two angler counts during each trip and interviewing all anglers encountered at the fishery. Because the fishing day was changed in the middle of the first sampling period, all angler counts and interviews conducted outside the defined fishing day before 10 July could not be used.

An angler count was conducted by driving the entire causeway and counting anglers. All anglers could be seen from the causeway. All fish encountered in the harvest were measured for fork length. Both sagittal otoliths were collected from most char encountered. Scales were collected from all other species encountered in the survey.

Estimates of CPUE, HPUE, catch, and harvest were made for the three strata and combined to provide a combined estimate for the two sampling periods. These estimates were expanded to estimate CPUE, HPUE, catch, and harvest from 8 July through 5 August. Based upon angler counts and interviews at the beginning of the first sampling period and the end of the second sampling period, little or no fishing was assumed to have occurred before or after the sampling periods. Therefore, the majority of the fishing was assumed to have occurred between 8 July and 5 August. The estimates were expanded by splitting the number of days between the sampling periods that were not sampled and adding the additional time to each strata. The first two strata became estimates that included 8 July through 22 July and the third strata included 23 July through 5 August. New estimates were made for each expanded strata and summed to provide expanded estimates for the entire fishery.

Results and Discussion

During the two sampling periods, 73 angler counts were conducted and 111 anglers were interviewed (Table 51). Of the anglers interviewed, 60 had

Table 51. Number of angler interviews, angler counts, and estimates of angler-effort (hours) at the West Dock causeway, Prudhoe Bay, Alaska, 1988.

Stratum	Angler Interviews			Angler-Effort			
	Complete	Incomplete	Total	Counts	Hours	SE	CV(%)
11 Jul - 17 Jul							
0700-1000 Hours	11	6	17	14	33	6	18
1900-2200 Hours	33	45	78	19	105	9	9
26 Jul - 5 Aug[1]	16	0	16	40	13	5	36
Combined	60	51	111	73	151	12	8
Expanded	60	51	111	73	234	33	14

[1] Included both morning 0700-1000 and evening 1900-2200 time periods.

completed fishing and 51 were still fishing (Table 51). Estimated angler effort combined for the two periods was 151 angler hours and the expanded estimate was 234 angler hours (Table 51). CPUE and HPUE estimates for the char were 0.79 and 0.50, respectively (Table 52). An estimated total of 185 char were caught, with 116 fish harvested (Table 52). Arctic cisco CPUE and HPUE were estimated to be 0.10 and 0.06, respectively with a catch of 25 and harvest of 15 (Table 52). Least cisco CPUE and HPUE were estimated to be 0.15 and 0.06, respectively. Thirty-four least cisco were caught and 15 harvested (Table 52).

Only 20% of the anglers interviewed caught one or more char (Table 53). Of these, the anglers that caught between one and five fish accounted for 70% of the catch and 66% of the harvest.

Char in the harvest sample at the West Dock causeway ranged in age from 7 to 15 years with a mean fork length of 551 mm (Table 54). The dominant age classes were 10 and 11 years (Table 54). Of the fish harvested, approximately 65% were composed of preferred and memorable size char with no fish in the trophy size range (Table 54).

Demographic profiles show that the majority of the anglers were male (98%), adult (100%), residents (98%), and used spinners (99%) as their terminal gear type (Table 55). These same anglers gave the char fishery a mean rating of 3.11 (fair to poor) with 1 = Excellent, 2 = Good, 3 = Fair, and 4 = Poor (Table 56).

Most of the observed harvest of char took place during the first sampling period. Angler effort and success was found to be highly dependent upon the weather, angler success the previous evening, and the presence of sea ice. Anglers were present during all kinds of weather, from fair to inclement; however, more anglers were present during fair weather conditions. Also, if char were caught one evening, a significant increase in anglers would be seen the following evening. At times, onshore winds stacked ice along the causeway, causing anglers to fish less preferred areas along the causeway. Sea ice likely serves to concentrate char along the coastline in early summer. As summer progresses, sea ice melts and moves farther offshore, allowing the char to move farther offshore and out of reach of the anglers. The offshore movement of ice around 15 July, and consequent availability of additional habitat for use by char, likely contributed to the decreased angler success in late July and August.

Other areas are also used by anglers fishing for char in the Prudhoe Bay area; however, the extent to which these areas are used is not known. Anglers fish for and reportedly catch char in the lower Putuligayuk River in early July before fish are caught at the West Dock causeway. Anglers reportedly caught char along the Endicott causeway located to the east of Prudhoe Bay and offshore of the Sagavanirktok River delta. Anglers also fished for char in the Sagavanirktok River at the Sagavanirktok River bridge, along the Dalton Highway just south of Deadhorse, and at a few locations between these two areas.

Table 52. Estimates of CPUE (catch-per-hour), HPUE (harvest-per-hour), catch, and harvest of Dolly Varden (char), Arctic cisco, and least cisco at the West Dock causeway, Prudhoe Bay, Alaska, 1988.

Stratum	CPUE			HPUE			Catch			Harvest		
	Mean	SE	CV(%)	Mean	SE	CV(%)	Total	SE	CV(%)	Total	SE	CV(%)
Dolly Varden (Char)												
11 Jul - 17 Jul												
0700-1000 Hours	0.282	0.063	22	0.234	0.063	27	9	3	29	8	3	32
1900-2200 Hours	1.035	0.127	12	0.630	0.116	19	109	16	15	66	13	20
26 Jul - 5 Aug[1]	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
Combined	0.780	0.110	14	0.489	0.101	21	118	17	14	74	14	19
Expanded	0.794	0.142	18	0.497	0.131	26	185	41	22	116	31	27
Arctic cisco												
11 Jul - 17 Jul												
0700-1000 Hours	0.282	0.083	32	0.187	0.061	32	9	3	37	6	2	37
1900-2200 Hours	0.060	0.025	42	0.030	0.013	42	7	3	43	3	1	43
26 Jul - 5 Aug[1]	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
Combined	0.103	0.044	43	0.062	0.030	49	16	4	27	9	3	28
Expanded	0.105	0.057	55	0.063	0.039	6	25	9	35	15	5	36
Least cisco												
11 Jul - 17 Jul												
0700-1000 Hours	0.188	0.112	60	0.094	0.056	60	6	4	62	3	2	62
1900-2200 Hours	0.150	0.053	35	0.060	0.025	42	16	6	36	6	3	43
26 Jul - 5 Aug[1]	0.000	0.000	0	0.000	0.000	0	0	0	0	0	0	0
Combined	0.145	0.069	47	0.062	0.034	54	22	7	31	9	3	35
Expanded	0.148	0.089	60	0.063	0.044	69	34	14	41	15	7	46

[1] Included both morning 0700-1000 and evening 1900-2200 time periods.

Table 53. Distribution of Dolly Varden (char) catch and harvest among anglers interviewed at the West Dock causeway, Prudhoe Bay, Alaska, 1988.

Number of Fish	Catch						Harvest					
	n[1]	%	Cumm %	n[2]	%	Cumm %	n[1]	%	Cumm %	n[2]	%	Cumm %
0	80	72	72	--	--	--	92	82	82	--	--	--
1	15	13	85	15	20	20	10	9	91	10	21	21
2	4	4	89	8	11	31	3	3	94	6	13	34
3	7	6	95	21	27	58	2	2	96	6	13	47
4	1	1	96	4	5	63	1	1	97	4	8	55
5	1	1	97	5	7	70	1	1	98	5	11	66
6	2	2	99	12	16	86	1	1	99	6	13	79
10	0	0	99	0	0	86	1	1	100	10	21	100
11	1	1	100	11	14	100	0	0	100	0	0	100
Total	111			76			111			47		

[1] Number of anglers interviewed (complete-trip only) that caught or harvested a certain number of Dolly Varden (char).

[2] Number of Dolly Varden (char) caught or harvested by each group of anglers interviewed.

Table 54. Estimates of the contributions of each age class, mean fork length (mm) at age, and Relative Stock Density (RSD) of Dolly Varden (char) in the harvest sample from the West Dock causeway, Prudhoe Bay, Alaska, 1988.

	Age Composition			Fork Length[1]		Relative Stock Density (RSD)				
Age	n	%	SE (%)	Mean	SE	Category	Range[2]	n	%	SE (%)
7	3	9	5	424	14	Stock	250-414	2	5	22
8	2	6	4	438	21	Quality	415-549	12	29	14
9	1	3	3	650	--	Preferred	550-649	20	49	11
10	8	25	7	553	9	Memorable	650-749	7	17	15
11	7	22	7	575	10	Trophy	750-up	0	0	--
12	4	13	6	621	14					
13	4	13	6	596	14	Total		41		
14	2	6	4	662	26					
15	1	3	3	620	--					
Total	32			551	20					

[1] Fork length is in millimeters (mm).

[2] Range is the fork length range of the RSD category in mm. Taken from the ranges provided by Gabelhouse, Jr. (1984) for Arctic char. Arctic char range was used because the Dolly Varden (char) length categories used by Gabelhouse, Jr. (1984) refer to freshwater fish. These Dolly Varden (char) spend part of their lives in marine systems and are better represented by the Arctic char length categories.

Table 55. Demographic profile of anglers interviewed at the West Dock causeway, Prudhoe Bay, Alaska, 1988.

Angler Characteristic	n	%	SE (%)	Angler Characteristic	n	%	SE (%)
Total Number of Interviews[1]	111	--	--	Local[2]	---	---	--
				Non-local	---	---	--
Male	109	98	1	Tourist	0	0	0
Female	2	2	1	Other	111	100	0
Adult	111	100	0	Gear Type:			
Youth	0	0	0	Spinners	110	99	1
				Flies	1	1	1
Resident	109	98	1				
Non-Resident	2	2	1				
Military	0	0	0				

[1] Includes both complete- and incomplete-trip angler interviews combined.
[2] Local and non-local anglers were not distinguised between during this creel survey.

Table 56. Opinions of anglers interviewed at the West Dock causeway, Prudhoe Bay, Alaska, 1988.

Question	Opinion	n	%	SE (%)
1. How would you rate the quality of fishing here this year?	Excellent (1)	7	7	3
	Good (2)	22	21	4
	Fair (3)	29	27	4
	Poor (4)	48	45	5
	Total	106		
	Mean Rating = 3.11			

In addition to char, anglers also fish for Arctic grayling in the Kuparak River near the Spine Road and near R pad, in the Kuparak Deadarm reservoirs, and in "Smith Creek" (a small stream that crosses Spine Road and is a westside tributary to the Kuparak River). Anglers said they fished these areas during periods of high winds, as the winds keep the mosquitoes at bay and as the winds often create sea and sometimes ice conditions that make fishing at the West Dock causeway impossible. Fishing pressure is probably not very high in these areas at this time.

Based upon observed and estimated harvest, the West Dock char fishery is not a significant source of mortality to stocks of char using the nearshore Beaufort Sea within the Prudhoe Bay area. A yearly creel survey is not indicated for this area at this time; however, should future reports indicate a significantly increased harvest is occurring, additional monitoring should be implemented.

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